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MINISTRY OF FORESTS

Invermere Timber Supply Area

Rationale for Allowable Annual Cut (AAC) Determination

Effective September 1, 2001

Larry Pedersen
Chief Forester

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Objective of this document

This document is intended to provide an accounting of the factors I have considered and the rationale I have employed as chief forester of British Columbia in making my determination, under Section 8 of the *Forest Act*, of the allowable annual cut (AAC) for the Invermere Timber Supply Area (TSA). This document also identifies where new or better information is needed for incorporation in future determinations.

Description of the TSA

The Invermere TSA comprises approximately 1 110 700 hectares in south-eastern British Columbia. The TSA lies in the British Columbia Forest Service (BCFS) Nelson Forest Region and is administered from the Invermere Forest District office in Invermere. The Invermere TSA is bounded by the Cranbrook TSA to the south, the Alberta border to the east, the Golden TSA to the north and the Kootenay Lake TSA as well as Tree Farm Licence (TFL) 14 to the west. Several provincial or national parks are adjacent to or within the TSA, including Mount Assiniboine Park, Height of the Rockies Wilderness Area, Purcell Wilderness Conservancy Area, Bugaboo Alpine Park, Top of the World Park, Elk Lake Park and Recreation Area, and Kootenay National Park.

The Invermere TSA contains varied and rugged topography. Two mountain ranges—the Rocky Mountains and the Purcell Mountains—are separated by the flat valley of the Rocky Mountain trench. A variety of climatic conditions occur within the TSA, contributing to diverse forests. The primary tree species is lodgepole pine, but forests are also comprised of Douglas-fir, ponderosa (yellow) pine, western larch, spruce, true fir (balsam), and western redcedar.

Of the entire TSA, approximately 280 100 hectares are not managed directly by the BCFS, including parks, ecological reserves, private land and various special use permit areas. An additional 342 600 hectares are considered non-productive or non-forested, including rock, swamp, alpine areas and water bodies. Productive Crown forest land managed by the BCFS is about 488 000 hectares or 44 percent of the total TSA area.

The Invermere TSA encompasses the communities of Invermere, Windermere, Canal Flats, Edgewater, Radium Hot Springs and Fairmont Hot Springs. The population of the TSA was 9230 persons in 1996, approximately 30 percent of which reside in the town of Invermere.

History of the AAC

The Invermere TSA was established in 1981 with an AAC of 670 000 cubic metres. A temporary two year increase of 1.8 million cubic metres was set in 1985 for salvage of timber burned through catastrophic 1985 wildfires. In 1986, an area from the Cranbrook TSA was added to the Invermere TSA, and the AAC was set at 696 190 cubic metres.

In 1989, a temporary increase of 40 000 metres for the harvest of small-diameter lodgepole pine stands was set for a three year period, bringing the AAC to 736 140 cubic metres. Around the same time, an area was transferred from the Invermere TSA to TFL 14, and Height of the Rockies Provincial Park was established. The AAC was correspondingly reduced to 697 264 metres, effective January 1, 1990. The temporary increase for

small-diameter pine was later extended but failed to attract interest from the industry. The AAC was reduced to 657 264 metres as of January 1, 1994.

In 1996, the chief forester determined the AAC to be 591 500 cubic metres, representing a reduction of 10 percent from the previous AAC. That level remains in effect today and is currently apportioned by the Minister of Forests as follows:

Apportionment	cubic metres/year	Percentage
Forest Licences – replaceable (5)	494 848	84
Timber Sale Licence, less than or equal to 10 000 m^3, replaceable	10673	2
SBFEP category 1	18 109	3
SBFEP category 2	12 166	2
SBFEP bid proposal	43 774	7
Forest Service Reserve	2 000	.5
Woodlot licences	9 930	1.5
Total	**591 500**	**100.0**

New AAC determination

Effective September 1, 2001 the new AAC for the Invermere TSA will be 581 570 cubic metres.

This AAC excludes 9930 cubic metres allocated to woodlot licences since the 1996 determination, and is otherwise unchanged from the previous AAC.

This AAC will remain in effect until a new AAC is determined, which must take place within five years of this determination.

Information sources used in the AAC determination

Information considered in determining the AAC for the Invermere TSA include the following:

- *Invermere TSA Data Package and Information Report*, BCFS, March 2000;
- *Invermere TSA Analysis Report and Public Discussion Paper*, BCFS, October 2000;
- Invermere TSA draft Summary of Public Input on Data Package and TSA Analysis Report, BCFS, February 2001;
- Letter from the Minister of Forests to the chief forester, dated July 28, 1994, stating the Crown's economic and social objectives for the province;
- Memorandum from the Minister of Forests to the chief forester, dated February 26, 1996, stating the Crown's economic and social objectives for the province regarding visual resources;

- Technical review and evaluation of current operating conditions through comprehensive discussions with staff of the BCFS, including the AAC determination meeting held in Radium, February 14 and 15, 2001;
- *Invermere TSA Rationale for AAC determination*, BCFS, January, 1996;
- *Invermere TSA Timber Supply Analysis*, BCFS, April 1995;
- *Invermere TSA Socio-Economic Analysis*, May 1995;
- *Forest Practices Code of British Columbia Act*, consolidated to March 2001;
- *Forest Practices Code of British Columbia Act* Regulations and Amendments, current as of March 2001;
- Forest Practices Code of British Columbia Guidebooks, BCFS and MELP;
- *Kootenay-Boundary Land Use Plan (KBLUP)*, 1995;
- Kootenay Boundary Land Use Plan Implementation Strategy (KBLUP IS), 1997;
- Kootenay-Boundary Higher Level Plan Order, Final, BCFS, December, 2000;
- *Fire Maintained Ecosystem Restoration in the Rocky Mountain Trench: A Blueprint for Action*, February 2000.
- *Estimating Operational Adjustment Factor 2's Attributable to Armillaria Root Disease in Managed Forests in the Kootenay Lake TSA*, D. Norris, BCFS, March 2000;
- *Invermere TSA Inventory Audit*, BCFS Inventory Branch, revised November 1996;
- *Forest Practices Code Timber Supply Analysis*, 1996;
- *Identified Wildlife Management Strategy*, February 1999;
- *Landscape Unit Planning Guide*, BCFS and MELP, March 1999;
- *Higher Level Plans: Policy and Procedures*, BCFS and MELP, December 1996.

Role and limitations of the technical information used

Section 8 of the *Forest Act* requires the chief forester to consider biophysical as well as social and economic information in AAC determinations. A timber supply analysis, and the inventory and growth and yield data used as inputs to the analysis, typically form the major body of technical information used in AAC determinations. Timber supply analyses and associated inventory information are concerned primarily with biophysical factors—such as the rate of timber growth and definition of the land base considered available for timber harvesting—and with management practices.

However, the analytical techniques used to assess timber supply are necessarily simplifications of the real world. There is uncertainty about many of the factors used as inputs to timber supply analysis due in part to variations in physical, biological and social conditions, although ongoing science-based improvements in the understanding of ecological dynamics will help reduce some of this uncertainty.

Furthermore, technical analytical methods such as computer models cannot incorporate all of the social, cultural and economic factors that are relevant when making forest management decisions. Therefore, technical information and analysis do not necessarily provide complete answers or solutions to forest management problems such as AAC determinations. The information does, however, provide valuable insight into potential

impacts of different resource-use assumptions and actions, and thus forms an important component of the information required to be considered in AAC determinations.

In determining the AAC for the Invermere TSA, I have considered known limitations of the technical information provided, and I am satisfied that the information provides a suitable basis for my determination.

Statutory framework

Section 8 of the *Forest Act* requires the chief forester to consider particular factors in determining AACs for TSAs and TFLs. Section 8 is reproduced in full as Appendix 1.

Guiding principles for AAC determinations

Rapid changes in social values and in our understanding and management of complex forest ecosystems mean that there is always some uncertainty in the information used in AAC determinations. In making a large number of determinations for many forest management units over extended periods of time, administrative fairness requires consistency when addressing these changes and associated uncertainties. To make my approach in these matters explicit, I have set out the following body of guiding principles. If in some specific circumstance it is necessary to deviate from these principles, I will provide a detailed reasoning in the considerations that follow.

Two important ways of dealing with uncertainty are:

(i) minimizing risk, in respect of which in making AAC determinations, I consider the uncertainty associated with the information before me, and attempt to assess the various potential current and future social, economic and environmental risks associated with a range of possible AACs; and

(ii) redetermining AACs frequently, to ensure they incorporate current information and knowledge—a principle that has been recognized in the legislated requirement to redetermine AACs every five years. The adoption of this principle is central to many of the guiding principles that follow.

In considering the various factors that Section 8 of the *Forest Act* requires me to take into account in determining AACs, I attempt to reflect as closely as possible operability and forest management factors that are a reasonable extrapolation from current practices. It is not appropriate to base my decision on unsupported speculation with respect either to factors that could work to increase the timber supply—such as optimistic assumptions about harvesting in unconventional areas, or using unconventional technology, that are not substantiated by demonstrated performance—or to factors that could work to reduce the timber supply, such as integrated resource management objectives beyond those articulated in current planning guidelines or the *Forest Practices Code of British Columbia Act* and its associated regulations (the Forest Practices Code).

The *Forest Practices Code of British Columbia Regulations* were originally approved by the Lieutenant Governor in Council on April 12, 1995, and released to the public at that time. The *Forest Practices Code of British Columbia Act* was brought into force on June 15, 1995.

Although the Forest Practices Code has been fully implemented since the end of the transition period on June 15, 1997, the timber supply implications of some of its provisions, such as those for landscape-level biodiversity, still remain uncertain, particularly when considered in combination with other factors. In each AAC determination I take this uncertainty into account to the extent possible in context of the best available information.

The eventual timber supply impacts associated with strategic land-use decisions resulting from the various planning processes—including the Commission on Resources and Environment (CORE) process for regional plans, the Protected Areas Strategy, and Land and Resource Management Planning (LRMP) process—are often discussed in relation to current AAC determinations. Since the outcomes of these planning processes are subject to significant uncertainty before formal approval by government, it has been and continues to be my position that in determining AACs it would be inappropriate to attempt to speculate on the timber supply impacts that will eventually result from land-use decisions not yet taken by government. Thus I do not account for possible impacts of existing or anticipated recommendations made by such planning processes, nor do I attempt to anticipate any action the government could take in response to such recommendations.

Moreover, even where government has made a formal land-use decision, it may not always be possible to fully analyze and account for the consequent timber supply impacts in a current AAC determination. In many cases, government's land-use decision must be followed by a number of detailed implementation decisions. For example, a land-use decision may require the establishment of resource management zones and resource management objectives and strategies for these zones. Until such implementation decisions are made it would be impossible to fully assess the overall impacts of the land-use decision. Nevertheless, the legislated requirement for five-year AAC reviews will ensure that future determinations address ongoing plan implementation decisions.

However, where specific protected areas have been designated by legislation or by order in council, these areas are deducted from the timber harvesting land base and are no longer considered to contribute to the timber supply in AAC determinations.

In the Invermere TSA, government's approval of the Kootenay-Boundary Land Use Plan (KBLUP) in 1995, and decisions on protected areas have clarified many aspects of land and resource use and management. The Kootenay-Boundary Higher Level Plan Order was designated by Cabinet on December 22, 2000. The implementation of this Higher Level Plan will provide further certainty regarding resource management in the area.

Forest Renewal British Columbia (FRBC) funds a number of intensive silviculture activities that have the potential to affect timber supply, particularly in the long-term. As with all components of my determinations, I require sound evidence before accounting for the effects of intensive silviculture on possible harvest levels. Nonetheless, I will consider information on the types and extent of planned and implemented practices as well as relevant scientific, empirical and analytical evidence on the likely magnitude and timing of any timber supply effects of intensive silviculture.

Some have suggested that, given the large uncertainties present with respect to much of the data in AAC determinations, any adjustments in AAC should wait until better data are available. I agree that some data are not complete, but this will always be true where information is constantly evolving and management issues are changing. Moreover, in the

past, waiting for improved data created the extensive delays that resulted in the urgency to redetermine many outdated AACs between 1992 and 1996. In any case, the data and models available today are improved from those available in the past, and will undoubtedly provide for more reliable determinations.

Others have suggested that, in view of data uncertainties, I should immediately reduce some AACs in the interest of caution. However, any AAC determination I make must be the result of applying my judgement to the available information, taking any uncertainties into account. Given the large impacts that AAC determinations can have on communities, no responsible AAC determination can be made solely on the basis of a response to uncertainty. Nevertheless, in making my determination, I may need to make allowances for risks that arise because of uncertainty.

With respect to First Nations' issues, I am aware of the Crown's legal obligations resulting from recent court decisions including those in the Supreme Court of Canada. The AAC that I determine should not in any way be construed as limiting those obligations under these decisions, and in this respect it should be noted that my determination does not prescribe a particular plan of harvesting activity within the Invermere TSA. It is also independent of any decision by the Minister of Forests with respect to subsequent allocation of the wood supply.

With respect to future treaty decisions, as with other land-use decisions it would be inappropriate for me to attempt to speculate on the impacts on timber supply that will result from decisions that have not yet been taken by government. I am aware that the entire Invermere TSA has been described as an 'area of interest' by the Ktunaxa Kinbasket First Nation. The Shuswap and Okanagan Nations have also asserted traditional territories within the Invermere TSA. Any decisions on treaty negotiations with the First Nations that are undertaken by government will be reflected in future AAC determinations for the TSA.

Overall, in making AAC determinations, I am mindful of my obligation as steward of the forest land of British Columbia, of the mandate of the Ministry of Forests as set out in Section 4 of the *Ministry of Forests Act*, and of my responsibilities under the *Forest Practices Code of British Columbia Act*.

The role of the timber supply analysis

In considering the factors required under Section 8 of the *Forest Act* to be addressed in AAC determinations, I am assisted by timber supply forecasts provided to me through the timber supply review process.

For each AAC determination for a TSA, a timber supply analysis is carried out using an information package including data and information from three categories—land base inventory, timber growth and yield, and management practices. Using this set of data and a computer model (Forest Stand Simulator, or FSSIM), a series of timber supply forecasts is produced, reflecting different starting harvest levels, rates of change over time, and potential trade-offs between short- and long-term harvest levels.

From this range of forecasts, one is chosen which attempts to avoid excessive changes from decade to decade and significant timber shortages in the future, while ensuring the long-term productivity of forest lands. This is known as the 'base case' forecast, and forms the basis for comparison when assessing the effects of uncertainty on timber supply.

Because it represents only one in a number of theoretical forecasts, and because it incorporates information about which there may be some uncertainty, the base case forecast for a TSA is not an AAC recommendation. Rather, it is one possible forecast of timber supply, whose validity—as with all the other forecasts provided—depends on the validity of the data and assumptions incorporated into the computer simulation used to generate it.

Therefore, much of what follows in the considerations outlined below is an examination of the degree to which all the assumptions made in generating the base case forecast are realistic and current, and the degree to which its predictions of timber supply must be adjusted, if necessary, to more properly reflect the current situation.

These adjustments are made on the basis of informed judgement, using current available information about forest management, which may well have changed since the original information package was assembled. Forest management data is particularly subject to change during periods of legislative or regulatory change, such as the enactment of the Code, or during the implementation of new policies, procedures, guidelines or plans.

Thus it is important to remember, in reviewing the considerations which lead to the AAC determination, that while the timber supply analysis with which I am provided is integral to those considerations, the AAC determination itself is not a calculation but a synthesis of judgement and analysis in which numerous risks and uncertainties are weighed. Depending upon the outcome of these considerations, the AAC determined may or may not coincide with the base case forecast. Judgements that may be based in part on uncertain information are essentially qualitative in nature and, as such, are subject to an element of risk. Consequently, once an AAC has been determined, no additional precision or validation may be gained by attempting a computer analysis of the combined considerations to confirm the exact AAC determined.

Timber supply analysis for the Invermere TSA

The base case harvest forecast presented in the *October 2000 Invermere Timber Supply Area Analysis Report* incorporated the most current available information on current forest management, land base and timber yields for the TSA. It included specific assumptions about the TSA that are discussed in detail in the analysis report.

In this rationale, I will discuss many of those analysis assumptions in the context of my considerations for this AAC determination. However, where my review of an assumption has concluded that I am satisfied it was appropriately modelled in the base case of the timber supply analysis, I will not discuss my considerations in detail in this document, other than to note my agreement with the approach that is already documented in the timber supply analysis report. In the case of the Invermere TSA, I am taking guidance from the *revised* base case forecast, as discussed below. Some factors for which the assumptions were appropriately modelled in the analysis may warrant discussion, however, for other reasons, such as a high level of public input, lack of clarity in the analysis report, or concerns resulting from the previous determination for the Invermere TSA. As a result, I may choose to provide my consideration of such factors in this rationale.

A 'base case' was generated which incorporated the factors appropriate to the TSA, and this base case was submitted for public review. In the analysis, 9930 cubic metres per year issued to woodlot licences since the 1996 determination were taken into account. As a

result, the base case initial harvest level was set at 581 570 cubic metres per year, rather than the current AAC of 591 500 cubic metres.

The base case harvest forecast projected that the initial harvest level of 581 570 cubic metres per year could be maintained for one decade followed by reductions over the subsequent two decades of approximately 10 percent to the long-term harvest level of 426 880 cubic metres per year.

Following the release of the published analysis report, an error was discovered in the assumed volumes available over time from partially harvested areas. A 'revised base case' forecast was generated using corrected assumptions, along with a set of sensitivity analyses.

In the revised base case harvest projection, the initial harvest level of 581 570 cubic metres per year could still be maintained for one decade. The harvest level then declined by 10 percent per decade for three decades, and by a further 8 percent before reaching the mid-term level of 388 880 cubic metres per year at the beginning of the fifth decade. The mid-term level was maintained for six decades, after which the harvest level increased to the long-term level of 419 881 cubic metres per year. Both the mid- and long-term harvest levels projected in the revised base case are lower than those in the original base case published in the analysis report.

The harvest levels projected in both the published and revised base cases in this timber supply analysis are greater than those projected for the first timber supply review for the Invermere TSA. Factors contributing to this difference include the following: increased volume estimates for natural stands as a result of improved inventory data; correction of errors in the modelling of ungulate winter range requirements which occurred in the first review; and refinements in the application of seral stage requirements since the previous determination.

There were specific considerations consistent with current timber supply review policies which led to the choice of the 2000 base case harvest forecast. These considerations were also applied in the selection of the revised base case harvest forecast, and included establishing an initial harvest level at the current AAC, as well as providing for an orderly transition from harvesting existing natural stands to future managed stands. The alternative harvest forecasts that were considered are discussed later in this document.

I have considered the reasoning used to select the revised base case harvest forecast, and I am satisfied that it provides a suitable basis from which to evaluate the assumptions regarding land base, management practices and timber yields for the Invermere TSA. I have also considered all public input received on the data package and analysis report, and where appropriate I discuss these in my considerations under the various factors presented in this rationale.

Consideration of Factors as Required by Section 8 of the *Forest Act*

Section 8 (8)

In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account

(i) the composition of the forest and its expected rate of growth on the area,

Land base contributing to timber harvesting

- general comments

As part of the process used to define the timber harvesting land base in the timber supply analysis, a series of deductions are made from the productive forest land base. These deductions account for the factors that effectively reduce the suitability or availability of the productive forest area for harvest, for ecological, economic or social reasons. In the Invermere TSA, the deductions (summarized in table 2 of the *October 2000 Invermere Timber Supply Area Analysis Report*) result in a timber harvesting land base of 241 759 hectares, or approximately 50 percent of the Crown productive forest land.

I have considered all of the deductions applied in the derivation of the timber harvesting land base for the Invermere TSA.

Those factors associated with the derivation of the timber harvesting land base for which, based on my thorough review, I accept the assumptions applied in the analysis are not discussed below. These factors include environmentally sensitive areas, deciduous forest types, low productivity sites, woodlots and protected areas.

Where my consideration of the information has identified a factor which in my estimation requires discussion in this document, it is described below.

- inoperable and steep slope areas

Those portions of the TSA which are neither physically operable nor economically feasible to harvest are categorized as inoperable, and are excluded when deriving the timber harvesting land base. For the Invermere TSA, operability mapping was originally completed in the early 1980's and has been reviewed twice since that time, most recently in 1997.

District staff indicate that the current operability mapping provides a good approximation of operable areas. District and licensee staff studied the options for new and innovative opportunities to utilize inoperable ground through the Invermere Enhanced Forest Management Pilot Project (EFMPP), and it was concluded that few harvest opportunities exist above the current operability line.

In the analysis, a total of 176 629 hectares was excluded as inoperable based on the operability mapping, which represents approximately 36 percent of the Crown productive forest.

The Invermere TSA contains very rugged terrain in the Rocky and Purcell Mountain ranges. Timber harvesting is not considered economical in the poorer productivity stands

on very steep slopes. As a result, deductions were applied in the analysis to account for these stands within the operable land base but occurring on very steep slopes.

BCFS staff reviewed steep slope exclusion criteria with licensees over the term of the previous determination, and revised the criteria to include site index. As a result, for the 2000 timber supply analysis, a combination of species, slope and site index criteria were used to exclude specific stands from the timber harvesting land base, for a total exclusion of 11 885 hectares.

Licensees contend that some of the steep slope areas excluded in the analysis are harvestable and should contribute to timber supply. In their input, licensee staff cite examples of past harvesting in the types of stands that were excluded through the criteria applied in the analysis. Overall, they indicate that up to 5 percent of recent harvesting has occurred in these types of stands.

The excluded steep slope areas comprise an area equivalent to 5 percent of the timber harvesting land base. Sensitivity analysis was conducted to assess the impact of including these areas in the timber harvesting land base. The results indicate that if it were appropriate to assume all of the stands in steep slope areas should contribute to timber supply, the initial harvest level could be 3 percent greater than projected in the revised base case. The harvest level in the sensitivity analysis begins a series of declines after one decade similar to those in the revised base case, to mid- and long-term levels approximately 5 percent greater than those in the revised base case.

However, district staff disagree with the assertions in the licensees' input. BCFS staff indicate that very little harvesting has occurred in the excluded stand types. Staff have again reviewed the criteria and harvesting history in light of the comments received, and consider that the exclusions applied in the analysis to account for stands on steep slopes are reflective of current operational limitations in the TSA. As a result they are confident that the analysis assumptions for steep slope exclusions were reflective of current practices in the Invermere TSA.

I have reviewed the information regarding the exclusions applied in the analysis to account for inoperable stands, including stands on steep slopes. I am mindful of the difficulties associated with precisely estimating operability on a land base with such rugged terrain as that prevalent in the Invermere TSA. Although I am aware of the licensee's assertion that some operations have occurred on steeper slopes, it is possible that such operations fall within the realm of normal give and take associated with the estimation of an operable land base. Typically, operations do occur in stands outside the operable land base, which are equally balanced by a lack of operations in stands considered operable but which may in fact prove to not be so over time. Over time and with technological advances, however, it may become more feasible to operate in steeper slope areas, and any such performance in these stand types will validate the potential contribution to timber supply and can be reflected in a future determination. The sensitivity analysis results indicate to me that any contribution from these stand types, while not preventing the mid term decline projected in the revised base case, may serve to mitigate it by some small amount.

For this determination, I am satisfied that the assumptions applied in the analysis for steep slope areas represent current limitations in harvesting performance in the TSA, and are

based on the best available information. Overall, the revised base case assumptions appropriately accounted for inoperable stands in the Invermere TSA.

Should information become available over the term of this determination which would indicate that harvesting is consistently occurring on steeper terrain, or otherwise in a significant manner outside the operable land base, then I recommend that operability be reviewed and adjusted to reflect this performance for the next determination.

- unmerchantable forest types

Unmerchantable or problem forest types are typically defined as stands which are physically operable and exceed low site criteria and yet are not currently utilized or have marginal merchantability. Typical stand characteristics may include the following: small size, small diameter, lack of merchantable stems, or lack of merchantable volume. These stand types are either wholly or partially excluded from the timber harvesting land base in the analysis.

In preparation for the timber supply analysis, district staff reviewed unmerchantable forest type criteria to attempt to refine and simplify the definitions. Previously, over 19 different unmerchantable forest types were identified using a set of criteria established in 1982. Some of these stand types comprised a very small area in the TSA. In the district staff's review, the dominant unmerchantable types were consolidated into three categories which were then 100 percent excluded in the timber supply analysis, for a total of 4700 hectares. BCFS staff indicate that the revised definitions capture the majority of unmerchantable types in the TSA.

Having reviewed the new unmerchantable forest type definitions, I find that the consolidated definitions make it difficult to ascertain whether all stands expected to be unmerchantable were truly excluded from the timber harvesting land base. A number of assumptions are inherent in the revised definitions which are not immediately apparent. For example, some lodgepole pine stands on steeper terrain that would normally be considered unmerchantable in this area, appear to not be excluded through the criteria and appear to be contributing to timber supply.

Licensees submitted input requesting more information about the assumptions inherent in the problem (unmerchantable) forest type definitions used in the analysis. The East Kootenay Environmental Society (EKES) expressed concern that problem forest types were not adequately accounted for given industry's lack of harvest in these stands.

The amount of area excluded as unmerchantable forest types during the previous timber supply analysis was significantly more than 4700 hectares. BCFS staff indicate that a number of factors may contribute to the much smaller exclusion. A reinventory has been completed in the TSA since the data was accumulated for the previous analysis, and many stands are now differently described. In addition, the land base exclusions were applied in a different order in the two analyses, and many of the unmerchantable stands may have been excluded under other overlapping deductions applied in the derivation of the timber harvesting land base.

BCFS staff also indicate that the structure of current inventory data make it difficult to precisely identify and exclude unmerchantable stands for the Invermere TSA.

Having considered the information about the exclusions applied to account for unmerchantable stands in the Invermere TSA, I am still concerned that some of these stands may have been retained in the timber harvesting land base and assumed to contribute to timber supply. In order to better assess whether there are any risks to timber supply on this account, I asked that district staff review the analysis data. In particular, I requested that staff review the overlap of unmerchantable forest types with other exclusions applied in the analysis, to confirm that these stands are not contributing to timber supply in a manner inconsistent with operational practices. This review has shown that the majority of unmerchantable types were indeed excluded through the various land base exclusions in the derivation of the timber harvesting land base. Any stands meeting the operational criteria for unmerchantable stands and remaining in the timber harvesting land base that occupy significant hectares are mature and old stands in intermediate BEO areas. In the analysis, these stands are reserved from harvest in order to meet mature plus old seral requirements for landscape level biodiversity. I am thus satisfied that there are no risks to short-term timber supply as a result of any uncertainty around unmerchantable forest type exclusions; however, I request BCFS staff review and refine the definitions prior to the next timber supply review for the Invermere TSA.

As a final note, I am also aware that licensee staff make note of the small log manufacturing facility in the TSA, and the continuous processing improvements which would indicate more performance in the types of stands excluded as unmerchantable. District staff state that performance has not been demonstrated to date. I note that if such performance is demonstrated in the future in these stands in the Invermere TSA, it will be appropriate to consider some timber supply contributions from these stands, but it would be premature to do so in this determination.

- roads, trails and landings

In the analysis, a percentage of the productive forested area was excluded to account for the permanent loss of productive land to roads, trails and landings. Separate estimates are made for existing and future structures, to reflect both potential changes in road building practices and road network requirements over time. Estimates account for the area that is permanently removed from the timber harvesting land base.

1) existing roads, trails and landings

In the analysis, existing mapped roads and associated rights-of-way were excluded from the timber harvesting land base using a Geographic Information System (GIS). A total of 6728 hectares were excluded in the derivation of the timber harvesting land base to account for existing mapped roads.

Licensee staff questioned the average right of way width assumed in the analysis, indicating that assumed widths of 20 metres for all roads is excessive. They also cite lower values from other adjacent TSAs. The East Kootenay Environmental Society (EKES) stated that right of way widths in many areas are greater than 20 metres.

District staff indicate that the analysis assumptions regarding right of way widths assumed for existing roads were not clearly stated in the analysis report. In the analysis, right of way widths of 20 metres for secondary roads and 10 metres for spur roads were assumed.

District staff indicate that the assumed right of way widths were developed based on the professional judgment of district engineering staff, and are an appropriate reflection of current operational practices in the TSA.

To account for existing landings and trails, district staff estimated site disturbance percentages using survey data and professional opinion. A total of 3.0 percent of the timber harvesting land base was estimated to be occupied by existing landings, and a further 4.5 percent by existing trails. The total value was reduced by 1 percent to reflect that some of these landings and trails were already accounted for in the exclusions for existing roads. BCFS staff applied the resulting value of 6.5 percent as a volume reduction to existing regenerated stands. The values include consideration of the recent limited rehabilitation of temporary access structures, and district staff state that the reductions appropriately reflect current practice.

2) future roads, trails and landings

To account for future roads, a 1.6 percent area reduction was applied to all existing natural stands following their first harvest. This lower percentage reduction takes into account the existing infrastructure of roads in the TSA. In the analysis, the total area excluded over time was 2650 hectares.

BCFS district staff assumed that future trails and landings would result in the same level of disturbance as existing structures, with the accounting for overlap with roads. As a result, a 6.5 percent volume reduction was applied to all future managed stand yield curves.

Licensees disagreed with the 4.5 percent exclusion for future trails, as well as the 3 percent value used for future landings. Licensee staff cite values used in adjacent TSAs which are lower than that used for the Invermere TSA analysis, and state that the soil disturbance data used to derive the estimates for the analysis does not reflect recent requirements for rehabilitation, or those related to soil protection. Further, licensee staff disagree that the disturbance leads to an equivalent amount of productivity loss, and in some cases may be shown to increase site productivity.

District staff indicate that they have considered the input from licensees regarding the site productivity losses assumed in the analysis to result from skidding disturbance and landing construction. District staff indicate that the research findings of site disturbance values presented by licensees were related to best practices only, and were confined to sites where full trail reclamation was carried out. District staff are concerned that the research did not address disturbance levels and site productivity losses in the following situations: during partial harvesting, where the same trail is used on subsequent entries; during conventional harvesting, where trail reclamation is not a legislated requirement. It also did not address the effects of random skidding on compactable soils, or productivity losses from 'cut to length' systems.

District staff indicate that limited data is available on comparisons between site disturbance and site productivity losses or gains available for the East Kootenays. The licencees' contention that site disturbance from skidding has a minimal or positive effect on site productivity is, as yet, unproven for current skidding practices.

District staff are confident that the methodology used and values applied provide an accurate reflection of expected productivity losses from current skidding and landing

construction practices. Staff indicate, however, that minimizing soil damage is a high priority in the TSA, and that if data begins to indicate that harvesting and road construction activities impact less on the soil resource, this can be reflected in a future analysis.

I have considered the information used in the analysis to account for both existing and future roads, trails and landings. I am aware that the Invermere TSA has a high proportion of calcareous soils which are prone to high levels of compaction. This information combined with the rugged topography indicates a unique set of operational conditions in the Invermere TSA. I am satisfied that it is not relevant to attempt to compare values to other TSAs or TFLs, other than to observe that I would expect the values appropriate to the Invermere TSA to be higher than the provincial average.

I am also aware of the district's continuing commitment to reduce the impact of harvesting and road building operations on the soil resource in the TSA. I note that the values applied in the 2000 timber supply analysis to account for both existing and future structures are lower than those applied in the previous analysis, which in part reflects the ongoing efforts to reduce impacts, as well as the work done to refine loss estimates.

In conclusion, I am satisfied that the methodology used to derive estimates for roads, trails and landings was thorough and sound and has resulted in exclusions which provide a reasonable reflection of productivity losses resulting from both current and anticipated operational practices. I encourage district and licensee staff to work together through the Enhanced Forest Management Pilot Project (EFMPP) or other means, to ensure that values continue to reflect operational practices.

Existing forest inventory

The inventory data used for the timber supply analysis is based on a forest inventory completed in 1994. For the analysis, the inventory file was updated to January 1, 1998 to account for changes in ownership, growth, and denudation through harvesting or fire.

I have considered the information about the forest inventory, and am satisfied that the best available information was used in the analysis. I note, however, that this determination occurs three years into the first decade of the analysis horizon, which may indicate that short-term timber supply is more sensitive to those factors exerting either downward or upward influences on it, than suggested by the various sensitivity analyses. I will discuss my considerations of this further under 'Reasons for decision'.

With respect to existing stand volume estimates, I have considered the information and am satisfied that the analysis assumptions were appropriate. As a result, I will not discuss my considerations any further in this document.

Expected rate of growth

I have considered the information regarding the assumed volumes for managed stands, including the various operational adjustment factors applied to volume estimates to account for seed trees, partial harvest and the influence of root diseases. I am satisfied that the analysis assumptions were appropriate in this regard, and I will not discuss my considerations in detail in this rationale.

- site productivity estimates

Inventory data includes estimates of site productivity for each forest stand. Site productivity is expressed in terms of a site index, which is based on the stand's height as a function of its age. The productivity of a site largely determines how quickly trees grow, which in turn affects the time seedlings will take to reach green-up conditions, the volume of timber that can be produced, and the age at which a stand will reach a merchantable size.

In general, in British Columbia, site indices determined from younger stands (i.e. less than 31 years old), and older stands (i.e. over 150 years old) may not accurately reflect potential site productivity. In young stands, growth often depends as much on recent weather, stocking density and competition from other vegetation, as it does on site quality. In old stands, which have not been subject to management of stocking density, the trees used to measure site productivity may have grown under intense competition or may have been damaged, and therefore may not reflect the true growing potential of the site. This has been verified in several areas of the province where studies—such as the Old-Growth Site Index (OGSI) 'paired plot' project and the 'veteran' study—as well as results from using the Site Index Biogeoclimatic Ecosystem Classification System (SIBEC) suggest that actual site indices may be higher than those indicated by existing data from old-growth forests. Such studies indicate that site productivity has generally been underestimated by the inventory file data; managed stands tend to grow faster than projected by inventory-based site index estimates from old-growth stands.

No local site index studies have been conducted in the Invermere TSA. Sensitivity analysis was used to assess the impact to timber supply if site productivity is underestimated to the extent suggested by the OGSI studies. In the sensitivity analysis, the site indices of all stands older than 140 years of age were adjusted using the provincial OGSI data. For Douglas-fir, lodgepole pine and interior spruce, adjustments were based on paired plot data; for all other species, adjustments were based on veteran tree study data. The sensitivity analysis results indicate that beginning in decade six, mid- and long-term timber supply could be as much as 25 percent greater than indicated in the revised base case projection, if the provincial OGSI site productivity adjustments were applicable to the stands in the Invermere TSA.

In the sensitivity analysis, minimum harvestable ages and green-up ages were not adjusted to account for the increased site productivity in the sensitivity analysis. Adjusting these ages could potentially serve to further increase available timber supply.

District staff believe based on their experience that second growth site productivity is indeed underestimated by the site indices attributed to the old growth stands in the Invermere TSA. Observations of regenerating stands indicate much better growth than would be suggested by the site indices attributed to the older stands. However, staff do not know the magnitude of the underestimation, and no local studies have yet been conducted to provide better estimates.

Public input from the EKES urged the chief forester to not rely on adjusted site indices, because of the possible biases in the data as suggested in the OGSI reports. The EKES also requests that second growth stock not be used to maintain the existing harvest at an inappropriate level.

While I acknowledge that there is uncertainty related to the ultimate performance of stands relative to their potential, data from the paired-plot study clearly demonstrates that actual stands elsewhere in the province are growing at a much faster rate than would be expected based on measurements from the standing old growth inventory. Given existing silvicultural requirements, it is reasonable to expect that full stocking will occur in the majority of managed stands in the Invermere TSA, and that the stands will be managed to minimize losses to pests and competing vegetation. Therefore, while the exact magnitude of the productivity increase is not certain, I believe it is highly reasonable to expect that most second-growth stands will grow more quickly than productivity estimates from old-growth stands would suggest. In this determination, I am prepared to take into account the implications of this underestimation for timber supply, and that timber supply in the mid to long term is greater than projected in the revised base case. I will discuss my considerations of this further under 'Reasons for decision'.

I note that local data will provide much needed certainty around the magnitude of site productivity adjustments appropriate for the Invermere TSA, and I strongly encourage the collection of data from stands within the TSA over the term of this determination.

- use of select seed

The Forest Practices Code requires the use of the best genetic quality (seed and vegetative material) source available for regeneration. Select seed produced from seed orchards is the product of B.C.'s forest gene resource management program, which uses traditional tree breeding techniques to select naturally-occurring, well-adapted, healthy and vigorous trees.

Select seed from seed orchards produces trees that grow faster than those from natural stand seed. As a result, a stand composed of such trees has a greater volume at the same age than a natural stand with the same species composition. Current expectations are that the volume differences will begin to decrease beyond a certain stand age.

No adjustments were applied to account for the use of select seed in the revised base case forecast for the Invermere TSA. District staff indicate that select spruce seed has been used for approximately 15 percent of total regeneration over the past few years. Select larch seed has just become available for use. Evaluation of the timber supply impacts of the volume increases based on the current level of use of select seed indicates a 1 percent increase in long-term timber supply. Staff also estimated the impacts of the projected level of use and expected available genetic gains for the next ten years to be close to 10 percent, which could lead to an up to 10 percent increase in long-term timber supply.

I have considered the information regarding the use of select seed in the Invermere TSA. I am satisfied that it is appropriate to account for the timber supply implications of the current level of use, as discussed further under 'Reasons for decision'. As for the possible increases from projected future use, although I believe that these gains are likely to be realized over the next ten years, I am satisfied any expected gains can be accounted for in a future determination, once that level of use is clearly demonstrated.

- minimum harvestable ages

A minimum harvestable age is an estimate of the earliest age at which a forest stand has met minimum merchantability criteria. In practice, many forest stands may be harvested

beyond the minimum harvestable age due to constraints on harvesting which arise from managing for other forest values such as visual quality, wildlife and water quality.

In the analysis for the Invermere TSA, minimum harvestable ages for stands were determined based on criteria of species, minimum stand volume, minimum stem diameter and expected harvest system. District staff compiled the criteria through a review of data from current practices. The ages ranged between 65 and 130 years for natural stands, and between 70 and 135 years for managed stands. District staff indicate that the criteria used for minimum harvestable ages are reflective of current harvesting practices in the TSA.

Sensitivity analysis was used to assess the timber supply implications of increasing or decreasing minimum harvestable ages. The results indicate that lowering the minimum harvestable ages by 10 years resulted in an earlier adjustment to the long-term harvest level at the start of decade 5, instead of the reduced mid-term level projected in the revised base case. Increasing the ages by 10 years resulted in a one decade delay in reaching the long-term harvest level as compared to the revised base case harvest projection.

It is always difficult to precisely estimate minimum harvestable ages as to some extent it requires an estimation of future preferences and markets. I have considered the information regarding minimum harvestable ages, and I accept that the assumptions applied in the analysis are an appropriate reflection of current practice. However, I encourage district staff to continue to review the criteria to ensure that they represent operational considerations over time. The criteria used in the analysis resulted in minimum harvestable ages relatively close to the culmination age for stands (i.e., the age at which the volume increment is maximized). Consideration of ages closer to 95 percent of the age at which the maximum volume is achieved could allow for increased flexibility in harvest scheduling.

Mid- and long-term timber supply showed considerable sensitivity to changing minimum harvestable ages. I am mindful that the ages were not adjusted in the sensitivity analysis conducted to assess the impacts of site productivity increases (see *site productivity*). From review of the information, I would expect that adjusting minimum harvestable ages for managed stands to account for greater site productivity would serve to increase mid- to long-term timber supply. As discussed under *site productivity*, I am taking into account in this determination that site productivity of managed stands is underestimated. I will discuss my consideration of the implications of this for minimum harvestable ages further under 'Reasons for decision'.

(ii) the expected time that it will take the forest to become re-established on the area following denudation,

Expected time for forest to be re-established following harvest

I have reviewed the information regarding regeneration, regeneration delay, impediments to regeneration and not-satisfactorily-restocked areas, and I am satisfied that the assumptions in the analysis for these factors were appropriate.

(iii) silviculture treatments to be applied to the area,

Silvicultural treatments to be applied

I have reviewed the information regarding silvicultural systems, commercial thinning and incremental silviculture, and I am satisfied that the revised base case assumptions for these factors were appropriate.

(iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,

Timber harvesting

I have reviewed the information regarding the utilization standards and the decay, waste and breakage factors assumed in the analysis for the Invermere TSA, and I am satisfied that these factors were appropriately modelled in the analysis.

(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production,

Integrated resource management objectives

The Ministry of Forests is required under the *Ministry of Forests Act* to manage, protect and conserve the forest and range resources of the Crown and to plan the use of these resources so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated. Accordingly, the extent to which integrated resource management (IRM) objectives for various forest resources and values affect timber supply must be considered in AAC determinations.

To manage for resources such as water quality and aesthetics, current harvesting practices limit the size and shape of cutblocks and amount of disturbance (areas covered by stands of less than a specified height), and prescribe minimum green-up heights for regenerated stands on harvested areas before adjacent areas may be harvested. Green-up requirements provide for a distribution of harvested areas and retention of forest cover in a variety of age classes across the landscape.

In the timber supply analysis, as described in the *October 2000 Invermere Timber Supply Area Analysis Report*, several management zones were created and different forest cover constraints were applied to the stands in each zone. These management zones—community watersheds, eco-restoration, visuals, ungulate winter range, caribou, and integrated resource management—were developed to reflect different operational considerations.

I have reviewed the information presented to me regarding the analysis assumptions for visually sensitive areas, domestic watersheds, cultural heritage resources, riparian habitat, fire-maintained ecosystem restoration, and stand level biodiversity, and I am satisfied that the analysis has appropriately reflected operational constraints within these areas. I am also satisfied that, with the exception of areas noted in the following sections, that the assumptions regarding these factors in the analysis are consistent with the

Kootenay-Boundary Higher Level Plan Order. As a result, I will not discuss my considerations of these factors within this rationale document. The factors discussed below are those for which I believe my considerations require some detailed explanation.

- cutblock adjacency/green-up

Objectives for forest cover and cutblock adjacency guide harvesting practices in order to address resource values such as wildlife, water, and visual quality. The adjacency objectives modelled in the analysis address minimum green-up height required before an adjacent area may be harvested, and the maximum area permitted to be less than the minimum green-up height. The FSSIM timber supply analysis model does not represent adjacency objectives explicitly. Rather, in timber supply analysis adjacency is modelled implicitly through a forest cover constraint which limits the amount of area on which trees may be below a specified green-up height.

At the time of the previous analysis for the Invermere TSA, some uncertainty existed around the forest cover requirements modelled to approximate adjacency, as it was acknowledged at that time that some portions of the TSA would likely be subject to more restrictive constraints than modelled. I requested in my AAC determination at that time that district staff clarify the adjacency and green-up constraints prior to the next determination.

During the accumulation of data for the 2000 timber supply analysis, district staff reviewed the adjacency and green-up objectives guiding current practices, and developed a forest cover constraint to reflect the objectives. In the integrated resource management zone, a maximum of 25 percent of the stands on the timber harvesting land base were permitted to be less than 3 metres in height at any one time. In other words, at all times, at least 75 percent of the stands on the timber harvesting land base were required to be at least 3 metres in height in order to meet adjacency objectives. This green-up height was correlated to an age of 12 years using local data similar to that described in the report entitled *Age to Green-up: Using Regeneration Survey Data*. To reflect operational practice, those stands subject to partial harvesting were exempt from green-up and adjacency requirements.

Following the completion of the analysis, a 2.5 metre green-up height was established for the Invermere TSA through the Kootenay-Boundary Higher Level Plan Order. This height correlates to an average green-up age of 10 years for the stands in the Invermere TSA.

Sensitivity analysis was conducted to evaluate the impact to timber supply of decreasing the green-up age to reflect the intent of the higher level plan order. Decreasing the age from 12 years to 10 years had no effect on timber supply.

Public input from the EKES questioned how the chief forester's request in the 1996 determination had been addressed, and also expressed concern about how green-up considerations are accounted for in partially harvested areas. As mentioned above, district staff did review adjacency and green-up objectives in preparation for this timber supply review. In addition, district staff note that the segregation of areas scheduled for partial harvest into separate analysis units is intended to ensure that the management considerations for these areas were appropriately reflected in the analysis.

Licensees questioned the application of a 3 metre green-up height to the ecorestoration zone which encompasses the Rocky Mountain Trench. However, BCFS staff state that the forest cover constraint was applied to managed stands in the Trench area in order to simulate a rate of harvest that reflects the expected management under the objectives for the area (as outlined in the *Fire Maintained Ecosystem Restoration in the Rocky Mountain Trench: A Blueprint for Action, February 2000*).

The higher level plan order also contains direction to manage for patch size to simulate natural patch size distributions as outlined in the *Biodiversity Guidebook*. District staff indicate that patch size objectives have not yet been implemented in the TSA. As patch size objectives are implemented in current practice, the timber supply implications can be reflected in a future determination for the Invermere TSA. In any event, I note that research results to date have indicated that timber supply is not additionally constrained by patch size requirements.

I have considered the information regarding the cutblock adjacency and green-up constraints applied to the stands in the integrated resource management zone. I am satisfied that the data, analysis assumptions and modelling approach to adjacency and green-up in the 2000 timber supply analysis provides a reasonable reflection of current practice, with the exception of the green-up height assumed in the revised base case. I note that it is appropriate to consider the implications of adjusting the green-up heights to 2.5 metres, in accordance with the established Kootenay Boundary Higher Level Plan Order. However, the sensitivity analysis results indicate that timber supply is very insensitive to green-up constraints in the Invermere TSA, and as a result, I am satisfied that I do not need to make adjustments in this determination on account of this factor.

- recreation

The forests in the Invermere TSA are used for a variety of recreational pursuits by local residents as well as tourists. Activities include downhill, cross-country, heli- and backcountry skiing, snowmobiling, hiking, and camping, as well as boating and fishing on the numerous lakes.

There are 55 recreation sites and over 200 kilometres of recreation trails in the TSA. The majority of the recreation sites are contained within areas classified by the forest inventory file under the Use, Recreation, Enjoyment of the Public (UREP) designation. Harvesting is typically restricted around recreation sites and some of the recreation trails in the TSA.

In the timber supply analysis, those UREPs less than 100 hectares in size were assumed to be associated with recreation sites, and as a result these areas were excluded in the derivation of the timber harvesting land base. Those UREPs greater than 100 hectares in size were retained in the timber harvesting land base as timber harvesting is considered to be consistent with the resource values in larger UREP areas.

Input from both Tembec and Slocan Forest Products questioned the exclusion of any UREP areas, believing that the application of a forest cover or similar constraint would have provided a better reflection of management constraints. However, district staff state that harvesting tends to be inconsistent with the management objectives around recreation sites, and that exclusion of the smaller UREPs associated with recreation sites is therefore

appropriate. Overall, staff indicate that the assumptions applied in the analysis to account for recreation values are reflective of current practice.

However, due to the presence of some misclassification in the inventory, some of the larger UREPs were inadvertently excluded from the timber harvesting land base in the analysis. The timber harvesting land base was underestimated by 1093 hectares or approximately 0.5 percent as a result.

I have reviewed the information about recreation resources in the Invermere TSA. I accept that the exclusion from timber harvesting of the UREPs associated with recreation sites is consistent with current practices in these areas, and that the assumption in the analysis to exclude UREPs smaller than 100 hectares provides a good estimation of these areas.

I am also satisfied that it is appropriate to consider the larger UREPs to contribute to timber supply. Therefore, I conclude that the timber harvesting land base has been underestimated by 1093 hectares, and I will discuss my considerations of this underestimation further under 'Reasons for decision'.

In addition, I note that public input regarding the use of forests in the Invermere TSA for recreational pursuits was received during the review of the data package and timber supply analysis report. This input included an overall theme that timber harvesting activities and other pursuits such as recreation and tourism are incompatible uses of the forest. I disagree with this assumption, and also note that such a concept is inconsistent with the objectives in the Kootenay Boundary Higher Level Plan Order, which I take to represent a statement of public objectives for the Kootenay region. Experience has shown that with careful planning, harvesting and recreation activities can usually be integrated across the land base. District staff inform me that a recreation access plan is proposed in the Invermere TSA. The completion of such a plan should do much to resolve any conflicts between recreation and timber harvesting, and I look forward to the information provided for future determinations.

- wildlife habitat

The Invermere TSA supports an abundance of wildlife species, including grizzly and black bear, deer, elk, moose, caribou, mountain goat, mountain sheep, wolverine, wolf, and various small mammals and birds.

Specific requirements were modelled in the analysis for caribou habitat and ungulate winter range.

1) identified wildlife

'Identified wildlife' refers to species at risk (red- and blue-listed) and to regionally significant species which are potentially affected by forest management activities and which may not have been adequately accounted for with existing management strategies, such as those for biodiversity, riparian management, ungulate winter range or through the application of other forest cover constraints. Species at risk as defined under the Forest Practices Code also include those species that are not considered at risk provincially but which have regional populations that may be threatened. The intent is that by addressing the habitat needs of 'regionally important wildlife' early on, the possibility that they will become listed provincially as threatened or endangered at a later date may be avoided.

Volume I of the IWMS was released in February 1999 and details several species which may occur and which require future consideration in the TSA, including the following: bull trout, rubber boa, American bittern, northern goshawk, prairie falcon, sandhill crane, long-billed curlew, Lewis's woodpecker, bobolink, fisher, grizzly bear, mountain goat, and bighorn sheep. Volume II, which has yet to be released, may identify additional species. The species identified in Volume I will be managed through the establishment of wildlife habitat areas (WHAs) and implementation of general wildlife measures (GWMs), or through other management practices specified in higher level plans. One WHA for an identified wildlife species has been established thus far in the Invermere TSA. The analysis did not explicitly model any requirements for identified wildlife.

Based on data accumulated on the habitat requirements for the identified species, the estimated impact of management was projected at one percent of the short-term harvest level for the province. Government has committed to limiting the impact of management for identified wildlife to this level in the short-term.

I am mindful that only one WHA has been established in the Invermere TSA to date, comprising a small area. It is not possible in this determination to specify the exact location or precise amount of additional habitat area that will be required within the timber harvesting land base to implement the IWMS. However, given the Province's commitment both to implement the IWMS, and to limit short-term timber supply impacts to one-percent province wide, as well as the expected occurrence of identified wildlife in this TSA, I find it appropriate to account for a one percent impact on timber supply, and I will discuss this further under 'Reasons for decision.'

I encourage the appropriate staff work to establish WHAs and implement GWMs prior to the next determination for the Invermere TSA. The establishment of these areas is a significant protective measure of the Forest Practices Code, and will assist with long-term planning and reduce operational conflicts between wildlife and harvesting.

2) ungulate habitat

The Invermere TSA provides habitat for several ungulate species, including white-tailed deer, mule deer, mountain goat, bighorn sheep, moose, elk and caribou.

Mountain goat and bighorn sheep habitat requirements were not explicitly modelled as it was assumed that these species do not require snow intercept cover.

The forest cover requirements for caribou applied in the analysis were consistent with current practices and the management recommendations contained within the Kootenay-Boundary Higher Level Plan Order. I have reviewed the assumptions in the analysis for caribou habitat, and I am satisfied that the needs of this species were addressed appropriately.

To address the needs of elk, white-tailed deer and mule deer, MELP staff completed biophysical mapping of ungulate winter range (UWR) in 1980. This mapping was used in the development of the UWR provisions for the 1995 KBLUP, and the area was also made known as UWR under the Operational Planning Regulation provisions in 1998. The UWR in the Invermere TSA covers 18.8 percent of the timber harvesting land base (this percentage was incorrectly stated in the *October 2000 Invermere Timber Supply Area Analysis Report).*

In the timber supply analysis, an average forest cover constraint was applied by biogeoclimatic variant within landscape units, whereby at least 40 percent of the stands on the timber harvesting land base were required to be 121 years of age or more at all times.

District staff indicate that the average forest cover constraint applied in the analysis reasonably represents the species-specific constraints applied operationally to manage for mature forest cover, and as well is consistent with the intent of the KBLUP. The Kootenay-Boundary Higher Level Plan Order did not address UWR provisions. Staff expect that UWR provisions will be finalized through an UWR management plan being developed jointly by BCFS, BC Wildlife, industry and non-governmental organizations, and scheduled to be completed by October 2003.

Sensitivity analysis was conducted to assess the impact on timber supply of modifying the UWR forest cover constraint to reflect that applied in the IRM zone. Public input from the EKES questioned the inclusion in the analysis report of sensitivity analyses testing the removal of UWR constraints. As with all sensitivity analyses, the ones cited from the analysis report are intended only to illustrate timber supply dynamics as a result of uncertainty in information, and are not intended to indicate management preferences. The sensitivity analysis in question was also conducted against the revised base case harvest forecast and indicated a slight increase in mid-term timber supply.

Other public input from EKES questioned the forest cover constraint itself, as well as the ability of partial harvesting to meet the needs of ungulates. With respect to the first concern, as stated above district staff indicate that the forest cover objectives are consistent with the intent of the KBLUP, which I accept as an appropriate set of objectives developed through extensive research and consultation. Further, BCFS staff indicate that areas slated for partial harvest are not required to meet snow interception objectives.

However, BCFS staff indicate that application of the forest cover constraint to the entire area mapped as UWR likely provides a better representation of current practice, given that the entire mapped area is expected to provide for ungulate habitat needs. This view was also expressed by Slocan Forest Products. The forest cover constraint was applied only to the timber harvesting land base in the analysis.

Having reviewed the information about ungulate winter range, I also believe that management requirements for ungulate habitat would be better reflected through application of the forest cover constraint to the entire productive forest, rather than the timber harvesting land base. Given that UWR mapping is completed with species-specific criteria in mind to identify appropriate habitat, it can be assumed that all areas mapped as UWR indeed contain the appropriate attributes. MELP staff indicated that very little UWR exists above the operable forest, and that application of the forest cover constraint to the operable forest within the UWR would be appropriate.

I accept that it is appropriate to take into account the implications to timber supply of application of the forest cover constraint to this larger area, and I will discuss my considerations of this further under 'Reasons for decision'.

BC Wildlife staff noted that moose habitat was not included in the existing UWR mapping, and as a result they are concerned that the species was not accounted for adequately in the timber supply analysis.

Moose habitat overlaps to an extent with other ungulate habitat, as well as with other areas excluded in the analysis such as deciduous stands. BC Wildlife staff are uncertain as to whether full accounting for moose would additionally constrain the timber harvesting land base. Moose habitat is expected to be mapped and included in UWR by October 2003 under the operational planning regulation provisions.

I have reviewed the information about moose habitat requirements in the Invermere TSA. Appropriate forest cover objectives for moose will be developed in conjunction with the mapping of habitat prior to October 2003. I am satisfied that the overlap of areas suitable for moose habitat with areas excluded in the analysis for other reasons, as well as overlap with the UWR area already modelled in the analysis, has provided some accounting for moose. As mapping for moose is completed, better information will become available to more precisely describe the required forest cover objectives, and whether any additional timber harvesting land base may be constrained in the future.

Thus, I make no adjustments on this account for this determination, and look forward to any additional information which becomes available for future timber supply reviews.

3) grizzly bear habitat

Among the wildlife species that the Invermere TSA provides habitat for is grizzly bear. Although identified as a species under the IWMS, the management requirements for grizzly bear are generally accounted for separately and apart from the IWMS implementation.

The 1995 KBLUP contained recommendations for the management of grizzly bear habitat. These provisions are adhered to in current practice for the approval of operational plans. The provisions include management of habitat adjacent to avalanche tracks and management of access and road densities in critical drainages. The Kootenay-Boundary Higher Level Plan Order also contains direction regarding grizzly bear habitat. However, BCFS staff do not anticipate timber supply impacts additional to those associated with the assignment of biodiversity emphasis options through the landscape unit planning process, and the target retention levels for old and mature forest, to result from the management provisions specified in the higher level plan.

No specific constraints were applied in the timber supply analysis to account for grizzly bear habitat.

I have reviewed the information regarding grizzly bear habitat. As discussed under *landscape level biodiversity*, the analysis reflected the delineation of landscape unit boundaries and the assignment of biodiversity emphasis options in accordance with the higher level plan order. I am satisfied that management requirements for grizzly bear habitat will be met through the retention for old and mature forest assumed in the analysis, in conjunction with the accounting in this determination for the full application of old seral requirements in areas with low biodiversity emphasis and for the impacts of the establishment of connectivity corridors, all of which are consistent with the Kootenay-Boundary Higher Level Plan Order and current operational practice. My consideration of this is further discussed under 'Reasons for decision.'

- riparian habitat

Riparian habitats occur along streams and around lakes and wetlands. The Forest Practices Code requires the establishment of riparian reserve zones (RRZs) that exclude timber harvesting, and riparian management zones (RMZs) that restrict timber harvesting, in order to protect riparian and aquatic habitats. Stream classes (e.g. S1) described in the Riparian Management Area Guidebook are determined based on presence of fish, occurrence in a community watershed and average channel width criteria. The stream class is used to estimate RRZs and RMZs.

Riparian habitat was mapped for the entire Invermere TSA in 1998 using orthographic photography. This data was used in the timber supply analysis and district staff indicate that it captures the majority of RRZs for class S1, S2 and S3 streams in the TSA. In the timber supply analysis, an area of 5207 hectares or 2 percent of the timber harvesting land base was excluded to account for RRZs. RMZs along these streams were estimated to equate to an additional 1.2 percent of the timber harvesting land base. In the analysis, this was modelled as a 0.66 percent reduction applied to the volume curves of all stands. This value also provided accounting for some limited retention along S4, S5 and S6 streams.

District staff indicate that the assumptions in the analysis reasonably approximate management practices in RRZs and RMZs in the Invermere TSA. However, they note that management practices in S4, S5 and S6 streams may be adjusted over time to higher levels of retention.

I have reviewed the information regarding the methodology used in the analysis to account for management practices in riparian habitat. Although the methodology used is fairly unique to the TSA, I am satisfied that it provides an appropriate accounting of the management in riparian areas. I therefore accept that the best available information was used for this determination.

If future practices in RMZs indicate timber supply impacts additional to those accounted for in the analysis, I will take this into account in a future determination. However, I request that over the term of this determination, district staff attempt to better quantify retention levels in RMZs along all stream classes, so that this information can be used for the next analysis for the Invermere TSA.

- community watersheds

The Forest Practices Code provides a definition and management considerations for community watersheds. The Invermere TSA contains 13 designated community watersheds, and portions of these watersheds comprise approximately 2.5 percent of the timber harvesting land base. This was reflected in the analysis, although a typographical error in the October 2000 *Invermere Timber Supply Area Analysis Report* incorrectly cited the size of the timber harvesting land base associated with community watersheds.

In operational practice, watershed assessment procedures (WAPs) are carried out by hydrologists in community watershed areas to determine whether planned operations can be conducted without detriment to water quality. A WAP considers the cumulative effects of forest practices on the aquatic environment. The assessment of hydrological impacts includes an assessment of the potential for the following processes to occur as a result of

planned operational practices: changes to peak streamflows; accelerated landslide activity; accelerated surface erosion; channel bank erosion; and, changes to channel morphology. An evaluation of the interaction of these processes provides an indication of the sensitivity of the watershed to further forest development. Using the results of a WAP, forest managers can make recommendations concerning the level of further harvesting in the watershed. A key component of watershed management includes calculation of equivalent clearcut area (ECA), which is the area that has been harvested, cleared or burned, with consideration given to the silvicultural system, regeneration growth and location within the watershed.

In the timber supply analysis, a specific forest cover constraint was applied to community watersheds to approximate the constraints used in current practice to control hydrological recovery rates. No more than 20 percent of the timber harvesting land base in the watersheds was permitted to be less than 6 metres in height at any one time. The 6 metre height used in the analysis reflects the state where the watershed is 50 percent recovered hydrologically, and is based on current knowledge about watershed dynamics and hydrological recovery rates.

However, BCFS staff advise that the application of the forest cover constraint to the total Crown land area, rather than to the timber harvesting land base, more appropriately reflects the intent of the *Community Watershed Guidebook* and the *Interior Watershed Assessment Procedure Guidebook*. As a result, the application of the constraint to the timber harvesting land base as was done in the analysis was likely more restrictive than that required by current policy.

No specific sensitivity analysis was conducted to assess the timber supply implications of adjusting the area to which the constraint was applied. However, sensitivity analysis in which the forest cover constraints for all portions of the timber harvesting land base, including UWR areas, were relaxed to that applied in the IRM zone showed only a slight increase in mid-term timber supply. Only 2.5 percent of the timber harvesting land base lies in community watersheds, as compared to the much larger percent associated with UWR areas. As a result, I expect that timber supply was not affected by the slightly more restrictive constraint that was applied to community watershed areas in the analysis.

BCFS district staff indicate that they believe operational practices are more constrained in community watershed areas than reflected through guidebook policy. Having reviewed the information regarding the assumptions for community watersheds, I am mindful of the difficulties involved with incorporating operational considerations for management in watersheds into timber supply analysis. Regardless of how the forest cover constraints are applied in the analysis, I am satisfied that operationally, community watersheds are managed sensitively for water quality in a manner consistent with the Forest Practices Code.

I am satisfied that application of the forest cover constraint to the Crown land area is more consistent with provincial policy than applying it to the timber harvesting land base as was done in the analysis. However, the analysis results indicate that timber supply is unaffected by the analysis assumptions, and therefore I make no adjustment in this determination.

I acknowledge the concern of district staff that management objectives in community watersheds include considerations not entirely reflected in provincial policy requirements.

I request that staff attempt to clarify this concern, and any timber supply implications of management in community watersheds prior to the next analysis for the Invermere TSA.

I commend BCFS staff on their efforts to extrapolate the complex management requirements for water quality in community and domestic watersheds to constraints which can be used in timber supply analysis. I expect that as more information becomes available on management for water quality in watersheds, it can be incorporated into future analyses and determinations.

- landscape-level biodiversity

Achieving landscape-level biodiversity objectives involves maintaining forests with a variety of patch sizes, seral stages, and forest stand attributes and structures, across a variety of ecosystems and landscapes. Managing for biodiversity is based in part on the principle that this—together with other provisions in the Forest Practices Code, such as riparian management, maintenance of wildlife trees, and other forest cover objectives as discussed throughout this document—will provide for the habitat needs of most forest and range organisms. A major consideration in managing for biodiversity at the landscape level is leaving sufficient and reasonably located patches of old-growth forests for species dependent on, or strongly associated with, old-growth forests.

The delineation and formal designation of 'landscape units' is a key component of a sub-regional biodiversity management strategy. For the Invermere TSA, draft landscape unit boundaries and biodiversity emphasis option (BEO) designations were delineated by the district manager and designated environmental official in January 2000. The BEOs were legally established as part of the Kootenay-Boundary Higher Level Plan Order in December 2000. The landscape unit boundaries are expected to be finalized by 2002. The draft boundaries and final BEO assignments were used in the timber supply analysis.

I have reviewed the assumptions made to account for landscape level biodiversity in the analysis for the Invermere TSA, and am satisfied that the majority of the assumptions appropriately reflect the provincial policy direction for achieving landscape level biodiversity requirements provided in the *Landscape Unit Planning Guide,* as well as in the established Kootenay-Boundary Higher Level Plan Order. My consideration of those assumptions for which I believe some further discussion is required in this document is detailed below.

1) seral stage requirements

The 1995 KBLUP provided recommended target requirements for old and mature seral forest, and these requirements are also reflected in the HLP. Current management for landscape level biodiversity in the Invermere TSA includes provision for the maintenance of mature forest as well as old-growth forest.

Requirements for both mature and old forest were modelled in the timber supply analysis. The forest cover requirements were applied at the biogeoclimatic variant level within each landscape unit as a minimum percentage of the productive forest land base which must be retained in stands meeting the requirements for mature and old forest.

The *Landscape Unit Planning Guide* permits old forest requirements for areas with low BEOs to be met within three rotations, and describes no mature forest retention

requirements for these areas. The direction in the Kootenay-Boundary Higher Level Plan Order requires both mature and old seral retention in low BEO areas, and the mature plus old requirements must be met immediately. In the timber supply analysis for the Invermere TSA, the mature plus old seral requirements for low BEO areas were phased in over three rotations. As a result, the requirements applied in the revised base case were less constraining than required by the higher level plan.

In high and intermediate BEO areas, current provincial policy direction from the *Landscape Unit Planning Guide* requires old seral requirements to be met immediately. If it is not possible to immediately achieve targets in these areas, then Old Growth Management Areas (OGMAs) are designated in mature forested areas to recruit old growth forest. The Kootenay-Boundary Higher Level Plan Order contains recommendations for formal establishment of these areas, and prioritizes the areas from which the mature plus old requirements are to be met in a different manner than dictated by provincial policy in order to meet specific objectives, such as connectivity.

OGMAs have not yet been formally delineated in the Invermere TSA. However, a preliminary exercise to place them on the land base is underway. Information on the actual placement of OGMAs is not yet available for use in timber supply analysis, and as a result no estimate of the impact of the placement of these areas was included in the original analysis. However, district staff indicate that connectivity corridors have been delineated for the TSA, and that this information could be used in analysis to approximate the expected timber supply impacts.

I have considered the information regarding the seral stage contributions assumed to account for landscape level biodiversity objectives in the Invermere TSA. I am satisfied that it is appropriate to account for the timber supply implications of requiring mature plus old seral retention in low BEO areas immediately in accordance with the higher level plan, and I will discuss my considerations of this further under 'Reasons for decision'.

I have also considered the information about the eventual placement of OGMAs in the TSA. I believe that an analysis which uses the available information about connectivity corridor placement to approximate the anticipated placement of OGMAs in accordance with the Kootenay-Boundary Higher Level Plan direction provides a better assessment of the available timber supply under management requirements for old growth, than does the approximation provided by the revised base case. BCFS staff have advised me that a methodology to approximate the impact of the placement of OGMAs is available, in which the connectivity corridors are delineated in the analysis and stands within the corridors are assigned a lower harvest priority than those stands outside the corridors. I asked for this additional analysis to be completed, and I will discuss this further under 'Reasons for decision.'

2) contribution of Kootenay National Park

Typically in timber supply analysis, in accordance with provincial policy outlined in *Higher Level Plans: Policy and Procedures*, the forests in adjacent protected areas are considered to contribute to meeting seral stage requirements for landscape level biodiversity, if the planned management for these areas is consistent with the maintenance of the objectives.

Forest cover information was available for five protected areas within the Invermere Forest District, and the forested area within them were considered to contribute to the seral stage targets for biodiversity for those landscape units also within the Invermere TSA. However, for Kootenay National Park which bounds the Invermere TSA, forest cover information was not available for the park at the time the analysis was initiated. As a result the park was not considered in the calculation of seral stage targets.

District staff are uncertain about the age of the forests within the park, and as a result it is unclear as to the potential timber supply impacts of not including this area. BCFS staff plan to consult with Parks Canada staff to obtain the appropriate data regarding planned future management and forest age class structure.

I have considered the information, and I am satisfied that there is insufficient information for this determination to consider the contribution of Kootenay National Park to landscape level biodiversity requirements. I accept that the best available information was used in the analysis, and I request that BCFS staff work to obtain the necessary data to model this explicitly for the next timber supply analysis for the Invermere TSA.

3) future ages of non-contributing forests

In the timber supply analysis for the Invermere TSA, forests outside the timber harvesting land base were assumed to continue to age over time such that eventually all non-contributing forests were over 250 years of age.

The implications of this assumption are that no allowance is made for the possible influences that natural stand disturbances such as fire, insects or disease may have through time. In terms of landscape level biodiversity, a larger proportion of the old seral requirements are assumed to be met over time by non-contributing forests in the modelling than may be realized operationally. In the Invermere TSA, natural disturbance patterns are such that infrequent, but large wildfires affect the age class structure of the forests on the non-contributing land base. District and Timber Supply Branch staff agree that while it is difficult to model these uncertain events, the continued ageing of the non-contributing forest is not likely a realistic assumption. Public input also expressed concerns about the validity of the analysis assumptions.

I have reviewed the information regarding the analysis assumptions about the ageing of the forests on the non-contributing land base. It is clear that the forests outside the timber harvesting land base in the Invermere TSA do experience disturbances which were not reflected in the analysis. As a result, the contribution of these forests to meeting old-seral biodiversity objectives has likely been overestimated in the analysis. On this basis, in my determination I accept an unquantified overestimation in the mid- to long-term timber supplies projected in the revised base case. I requested BCFS staff conduct some additional analysis to estimate the timber supply implications of assuming a more natural disturbance pattern, and I will discuss my considerations of this additional analysis further under 'Reasons for decision'.

(vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,

Kootenay-Boundary Higher Level Plan Order

Portions of plans arising from strategic land use planning processes such as regional or subregional planning (land and resource management planning) may be declared as higher level plans under the Forest Practices Code. A higher level plan defined under the Forest Practices Code establishes government's social, economic and environmental objectives, thereby setting the resource management context for developing subsequent operational plans.

For the West Kootenay area, the Kootenay Boundary Land Use Plan (KBLUP) was completed and signed off by government in 1995. The Kootenay-Boundary Higher Level Plan Order, containing critical components of the KBLUP, was established by government in December 2000.

The majority of the recommendations arising from the KBLUP, and also contained within the higher level plan, that are relevant to operations and timber supply have been implemented in the Invermere TSA and form part of current practice for operations in the area. As discussed previously in this document, the timber supply analysis assumptions for wildlife habitat, landscape level biodiversity, riparian habitat, watersheds, visual quality and other IRM values were consistent with the recommendations of the plan.

The Kootenay-Boundary Higher Level Plan Order was not all-inclusive, and some provisions which arose from implementation of the KBLUP were not included in the higher level plan, either because they were already satisfactorily addressed by the Forest Practices Code (which was implemented after the 1995 KBLUP), because they did not affect operational or strategic planning and were determined to be handled through other means, or because the provisions were determined by government to result in unacceptable socio-economic impacts.

I am aware that current practice in the Invermere TSA is guided by the recommendations arising from the KBLUP. The majority of these recommendations were used in the development of the assumptions for the 2000 timber supply analysis, and in some instances I have made further adjustments in this decision to better reflect the Order. I believe that this period following the establishment of the Kootenay-Boundary Higher Level Plan Order by government will provide greater clarity around the management for specific resource values in the Invermere TSA. If, during the period following the establishment of the higher level plan, management considerations for specific values become less or more constraining than those which guided current practice between the KBLUP and the higher level plan order, then this can be factored into a future determination.

As described under *landscape level biodiversity* and *cutblock adjacency/green-up*, some aspects of the higher level plan were not explicitly modelled in the analysis. I am taking into account in this determination the timber supply implications of adjustments in these assumptions, as discussed further under 'Reasons for decision'.

(b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,

Alternative rates of harvest

The nature of the transition from harvesting old growth to harvesting second growth is a major consideration in determining AACs in many parts of the province. In the short term, the presence of large volumes of older forests often permits harvesting above long-term levels without jeopardizing the sustainability of future timber supply. In keeping with the objectives of good forest stewardship, AACs in British Columbia have been and continue to be determined to ensure that current and medium-term harvest levels will be compatible with a smooth transition toward the usually (but not always) lower long-term harvest level. Thus, timber supply should remain sufficiently stable so that there will be no inordinately adverse impacts on current or future generations. To achieve this, the AAC determined must not be so high as to cause later disruptive shortfalls in supply nor so low as to cause immediate social and economic impacts that are not required to maintain forest productivity and future harvest stability.

Several harvest forecasts would have been possible for the Invermere TSA, given the current management regime and assumptions made in the analysis. The assumptions for these options are discussed in detail in the *October 2000 Invermere Timber Supply Area Analysis Report.* Subsequent to the release of the analysis report, the alternative flows were re-evaluated using the corrected assumptions around volumes from partially harvested areas.

Under the revised assumptions, it was not possible to achieve two decades at the current AAC as shown in the analysis report without an unacceptable timber supply disruption in the mid-term. An even flow harvest level of 459 881 cubic metres per year was possible under the revised assumptions, a level that in the short term is approximately 22 percent below that of the current AAC.

The revised base case analysis also reflected harvest flow guidelines developed for timber supply reviews which seek to maintain the current AAC while allowing gradual declines in future harvest levels, and ensuring the attainment of maximum long-term harvest levels.

As mentioned earlier in this document under Base case for the Invermere TSA, I have reviewed the alternative harvest forecasts provided, and I am satisfied that the harvest flow selected for the base case, and subsequently for the revised base case, provides the most suitable forecast of timber supply, and provides a suitable basis from which to evaluate the assumptions applied in the analysis.

Community implications

I have reviewed the information presented in the socio-economic analysis for the Invermere TSA, and I am aware of the implications to communities of changes in the harvest levels for the TSA.

(c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities,

Timber processing facilities

I have reviewed the information regarding timber processing facilities, and I am aware of the reliance of timber processing facilities on the volume harvested in the Invermere TSA.

(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia,

Minister's letter and memorandum

The Minister has expressed the economic and social objectives of the Crown for the province in two documents to the chief forester—a letter dated July 28, 1994, (attached as Appendix 3) and a memorandum dated February 26, 1996, (attached as Appendix 4). The letter and memorandum include objectives for forest stewardship, a stable timber supply, and allowance of time for communities to adjust to harvest-level changes in a managed transition from old-growth to second-growth forests, so as to provide for community stability.

The Minister stated in his letter of July 28, 1994, that "any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability." He placed particular emphasis on the importance of long-term community stability and the continued availability of good forest jobs. To this end he asked that the chief forester consider the potential impacts on timber supply of commercial thinning and harvesting in previously uneconomical areas. To encourage this the Minister suggested consideration of partitioned AACs.

I have considered the contents of the letter and memorandum in my determination of an AAC for the Invermere TSA.

Local objectives

The Minister's letter of July 28, 1994, suggests that the chief forester should consider important social and economic objectives that may be derived from the public input in the timber supply review where these are consistent with government's broader objectives. Many public responses were received to the information report and data package, and to the timber supply and socio-economic analyses. The summary of public input is reproduced in full as Appendix 5.

The KBLUP, the intent of which forms current practice in the Invermere TSA and has been accounted for in this determination, was approved after years of public dialogue and negotiation. The Kootenay-Boundary Higher Level Plan Order was recently established by government which provides further clarification for some objectives as they continue to be interpreted and implemented.

Local objectives have been an important consideration in my determination of an AAC for the Invermere TSA. I have considered all public input received on the timber supply review, and where appropriate I have responded briefly to this input in this rationale.

(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

Unsalvaged losses

I have reviewed the analysis assumptions about unsalvaged losses in the Invermere TSA, and I am satisfied that losses were appropriately accounted for in the harvest projections.

Reasons for Decision

In reaching my AAC determination for the Invermere TSA, I have considered all of the factors presented to me, and I have reasoned as follows.

A revised base case prepared as part of the timber supply analysis projected that the initial harvest level of 581 570 cubic metres per year could be maintained for one decade, before beginning a series of declines to a mid-term harvest level of 388 880 cubic metres per year in decade 5. The long-term harvest level of 419 881 cubic metres per year is reached in decade 10.

Section 8 of the *Forest Act* requires me to consider a number of factors in the determination of an AAC for a timber supply area. In determining an AAC, my considerations identify factors which, when considered separately, indicate that the timber supply may actually be greater or less than that projected in the base case (the *revised* base case for the Invermere TSA). Some factors can be quantified and their impacts assessed with some reliability. Others may influence timber supply by introducing an element of risk or uncertainty to the decision, but cannot be reliably quantified at the time of the determination.

I am satisfied that the assumptions applied in the revised base case of the analysis for the majority of the factors applicable to the Invermere TSA were appropriate. Following is my consideration of those factors for which I consider it necessary in this determination to take into account implications to the timber supply projected in the revised base case.

Factors which indicate that the timber supply projected in the revised base case may be underestimated, and to a degree that can be quantified to some extent are as follows:

1) *use of select seed* – I accept that the level of select seed use in current operations, which was not accounted for in the revised base case analysis, indicates that timber supply is up to 1 percent greater in the mid to long term;
2) *recreation* – I accept that it is appropriate to account for the inclusion of 1093 hectares of misclassified UREP areas in the timber harvesting land base, which increases the size of the timber harvesting land base by approximately 0.5 percent and acts to increase timber supply across the entire analysis horizon;

Factors which indicate that timber supply projected in the revised base case may be underestimated, but to a degree that cannot be well quantified, are as follows:

1) *site productivity* – I accept that the site productivity of second growth forests is underestimated by site index measurements taken from existing old growth forests, although the magnitude of this underestimation is uncertain;

2) *ungulate winter range* – I accept that the forest cover constraints applied in the analysis to meet requirements for ungulate winter range were overly constraining to timber supply, as a result of their application to the timber harvesting land base rather than the operable forested land base. The application of the constraint to the larger land base likely would serve to increase timber supply;

In addition to those factors which indicate that timber supply may be underestimated in the revised base case, I have also identified a number of factors which indicate that the revised base case harvest projection likely overestimates timber supply, as follows:

1) identified wildlife management strategy – I accept that the implementation of the IWMS, including identification of wildlife habitat areas and attainment of general wildlife measures, will result in an impact to the timber harvesting land base in the TSA of up to 1 percent over the entire analysis horizon;

2) *landscape level biodiversity* – I am satisfied that it is appropriate to take into account the expected timber supply implications resulting from the full implementation of the higher level plan, including the provisions for connectivity corridors and grizzly bear habitat This can be approximated by setting low harvest priority in the analysis on those stands which fall within the delineated connectivity corridors, as well as the provisions for mature and old seral forest in low biodiversity emphasis areas;

3) *forest inventory* – I note that at the time of this determination, the initial harvest level projected in the revised base case harvest forecast is likely to be somewhat more sensitive to those factors exerting downward pressure on timber supply, as a result of the fact that at this time we are already three years into the first decade of the harvest projection.

I have reviewed the remaining factors briefly described above that my considerations have shown influence timber supply. While I am aware of the timber supply implications of each of these factors on its own merits, I acknowledge the difficulties associated with assessing their cumulative effect on the revised base case harvest projections. As a result, I requested that additional analysis be completed to provide me with an assessment of the interaction of the factors.

The additional analysis includes the following adjustments to the assumptions as compared to the assumptions applied in the revised base case:

- *landscape level biodiversity* - to account for the acceptance by government of the Kootenay-Boundary Higher Level Plan Order, approximation of the impact of eventual connectivity corridor placement within the TSA, which is also expected to account for the requirements for grizzly bear habitat;
- *landscape level biodiversity* - to account for the acceptance by government of the Kootenay-Boundary Higher Level Plan Order, the application of mature plus old seral forest requirement in low biodiversity emphasis areas, rather than the gradual phase in of requirements over three rotations which was modelled in the revised base case;

- *landscape level biodiversity* – simulating a rate of disturbance in the inoperable forest to ensure that the inoperable forest does not contribute to old seral forest requirements at a level unlikely to be realized operationally. This was achieved by reflecting a fire return interval approximating natural disturbances observed and substantiated by BCFS Protection Branch data for the TSA. Using a return interval of 125 years, two large fires were simulated to occur, in each of the 6th and 18th decades;
- *use of select seed* – the application of volume adjustments to all future regenerated stands using the 1 percent gain value calculated for available seed orchard supply for the TSA;
- *site productivity* - the application of half of the site index adjustments from the provincial OGSI paired plot studies to spruce and pine stands;
- *minimum harvestable ages* - recalculation of minimum harvestable ages based on the site productivity adjustments applied;
- *identified wildlife* - exclusion of 1 percent of the timber harvesting land base currently occupied by old seral forest, to approximate the expected impact of the placement of wildlife habitat areas and the implementation of general wildlife measures;
- *ungulate winter range* - application of the forest cover constraints used in the analysis to account for management in ungulate winter range to the forested operable land base rather than to the timber harvesting land base;
- *forest inventory* – update of the data in the forest inventory file to reflect the past three years of disturbance and growth;
- *recreation* – addition to the timber harvesting land base of the 1093 hectares of UREPs larger than 100 hectares;

The results of this additional analysis indicate that the short-term harvest level can be maintained for an additional two decades as compared to the revised base case forecast, after which the harvest level declines in a series of steps similar to the revised base case harvest projection. The harvest level reaches a long-term level of 446 881 cubic metres per year in decade 6.

Review of the analysis results indicate that two factors are largely responsible for the increase in timber supply relative to the revised base case harvest forecast. Adjustment of the managed stand volume estimates to account for half of the site productivity increases predicted by OGSI studies, in combination with the adjustment of the minimum harvestable ages to also account for the increased site productivity, results in a shift in the timing of the transition to harvest in managed stands, and an accompanying flexibility in the availability of existing stand volumes for harvest.

A sensitivity analysis was conducted to assess the timber supply implications of assuming no site productivity adjustment from OGSI, and as a result no shift in minimum harvestable ages. The sensitivity analysis results indicated that the short-term harvest level can still be maintained for the one decade projected in the revised base case. In this sensitivity analysis, the harvest projection followed that of the revised base case until decade 4, when it reached a slightly lower long-term harvest level of 394 880 cubic metres per year.

These sensitivity analysis results illustrate to me that short-term timber supply in the Invermere TSA is stable despite the additional factors acting to constrain timber supply.

Although I am convinced that site productivity is underestimated in the Invermere TSA—as it is elsewhere in the province—on sites currently occupied by old growth stands, I note that it is difficult to assess the magnitude of this underestimation without localized data. It is imperative that local site productivity data is collected in the TSA, as time and staff resources allow, over the term of this determination so that better assessment of the timber supply implications is possible for the future. In the meantime, I am confident that the short-term timber supply for the TSA is not dependent on the estimated provincial site productivity adjustments which have not yet been verified by local data. In any event, I am satisfied that the application of only half of the adjustment indicated by the provincial OGSI studies in the final analysis described above is a cautionary approach, given the high likelihood that site productivity is indeed underestimated, and by an amount in excess of the adjustment applied.

Having reviewed all of the information, I am satisfied that an appropriate harvest level for the Invermere TSA at this time is 581 570 cubic metres per year.

Determination

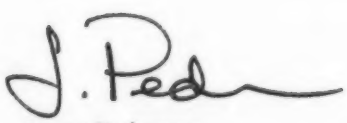
I have considered and reviewed all the factors as documented above, including the risks and uncertainties of the information provided. It is my determination that a timber harvest level that accommodates objectives for all forest resources during the next five years, that reflects current management practices as well as the socio-economic objectives of the Crown, can be best achieved in the Invermere TSA by establishing an AAC of 581 570 cubic metres. This AAC excludes 9930 cubic metres issued to woodlot licences since the previous determination, and is otherwise unchanged from the current AAC.

If additional significant new information is made available to me, or major changes occur in the management assumptions upon which I have predicated this decision, then I am prepared to revisit this determination sooner than the five years required by legislation.

Implementation

In the period following this decision and leading to the subsequent determination, I encourage BCFS staff to undertake the tasks and studies noted below that I have also mentioned in the appropriate sections of this rationale document. I recognize that the ability of staff to undertake these projects is dependent on available staff resource time and funding. These projects are, however, important to help reduce the risk and uncertainty associated with key factors that affect the timber supply in the Invermere TSA. I recommend that district staff:

- Review definitions of unmerchantable or problem forest types to ensure all stands are indeed captured;
- Monitor the amount of volume billed through the small scale salvage program to the AAC and bring forward values for discussion for the next determination;
- Develop analysis methods that better reflect operational constraints within community watersheds;
- Improve information regarding management practices in riparian management areas;
- Work with Parks Canada staff to obtain the data relevant to assess potential contributions to landscape level biodiversity from Kootenay National Park.



Larry Pedersen
Chief Forester
August 16, 2001

Appendix 1: Section 8 of the *Forest Act*

Section 8 of the Forest Act, Revised Statutes of British Columbia 1996, reads as follows:

Allowable annual cut

8. (1) The chief forester must determine an allowable annual cut at least once every 5 years after the date of the last determination, for

(a) the Crown land in each timber supply area, excluding tree farm licence areas, community forest areas and woodlot licence areas, and

(b) each tree farm licence area.

(2) If the minister

(a) makes an order under section 7 (b) respecting a timber supply area, or

(b) amends or enters into a tree farm licence to accomplish the result set out under section 39 (1) (a) to (d),

the chief forester must make an allowable annual cut determination under subsection (1) for the timber supply area or tree farm licence area

(c) within 5 years after the order under paragraph (a) or the amendment or entering into under paragraph (b), and

(d) after the determination under paragraph (c), at least once every 5 years after the date of the last determination.

(3) If

(a) the allowable annual cut for the tree farm licence area is reduced under section 9 (3), and

(b) the chief forester subsequently determines, under subsection (1) of this section, the allowable annual cut for the tree farm licence area,

the chief forester must determine an allowable annual cut at least once every 5 years from the date the allowable annual cut under subsection (1) of this section is effective under section 9 (6).

(4) If the allowable annual cut for the tree farm licence area is reduced under section 9 (3), the chief forester is not required to make the determination under subsection (1) of this section at the times set out in subsection (1) or (2) (c) or (d), but must make that determination within one year after the chief forester determines that the holder is in compliance with section 9 (2).

(5) In determining an allowable annual cut under subsection (1) the chief forester may specify portions of the allowable annual cut attributable to

(a) different types of timber and terrain in different parts of Crown land within a timber supply area or tree farm licence area, and

(b) different types of timber and terrain in different parts of private land within a tree farm licence area.

(c) [Repealed 1999-10-1.]

(6) The regional manager or district manager must determine an allowable annual cut for each woodlot licence area, according to the licence.

(7) The regional manager or the regional manager's designate must determine a rate of timber harvesting for each community forest agreement area, in accordance with

(a) the community forest agreement, and

(b) any directions of the chief forester.

(8) In determining an allowable annual cut under subsection (1) the chief forester, despite anything to the contrary in an agreement listed in section 12, must consider

(a) the rate of timber production that may be sustained on the area, taking into account

(i) the composition of the forest and its expected rate of growth on the area,

(ii) the expected time that it will take the forest to become re-established on the area following denudation,

(iii) silvicultural treatments to be applied to the area,

(iv) the standard of timber utilization and the allowance for decay, waste and breakage expected to be applied with respect to timber harvesting on the area,

(v) the constraints on the amount of timber produced from the area that reasonably can be expected by use of the area for purposes other than timber production, and

(vi) any other information that, in the chief forester's opinion, relates to the capability of the area to produce timber,

(b) the short and long term implications to British Columbia of alternative rates of timber harvesting from the area,

(c) the nature, production capabilities and timber requirements of established and proposed timber processing facilities,

(d) the economic and social objectives of the government, as expressed by the minister, for the area, for the general region and for British Columbia, and

(e) abnormal infestations in and devastations of, and major salvage programs planned for, timber on the area.

Appendix 2: Section 4 of the *Ministry of Forests Act*

Section 4 of the *Ministry of Forests Act* (consolidated 1988) reads as follows:

Purposes and functions of ministry

4. The purposes and functions of the ministry are, under the direction of the minister, to

   (a) encourage maximum productivity of the forest and range resources in British Columbia;
   (b) manage, protect and conserve the forest and range resources of the government, having regard to the immediate and long term economic and social benefits they may confer on British Columbia;
   (c) plan the use of the forest and range resources of the government, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated, in consultation and cooperation with other ministries and agencies of the government and with the private sector;
   (d) encourage a vigorous, efficient and world competitive timber processing industry in British Columbia; and
   (e) assert the financial interest of the government in its forest and range resources in a systematic and equitable manner.

Documents attached:

Appendix 3: Minister of Forests' letter of July 28, 1994

Appendix 4: Minister of Forests' memo of February 26, 1996

Appendix 5: Summary of Public Input

File: 10100-01

JUL 28 1994

John Cuthbert
Chief Forester
Ministry of Forests
595 Pandora Avenue
Victoria, British Columbia
V8W 3E7

Dear John Cuthbert:

Re: Economic and Social Objectives of the Crown

The *Forest Act* gives you the clear responsibility for determining Allowable Annual Cuts, decisions with far-reaching implications for the province's economy. The *Forest Act* provides that you consider the social and economic objectives of the Crown, as expressed by me, in making these determinations. The purpose of this letter is to provide this information to you.

The social and economic objectives expressed below should be considered in conjunction with environmental considerations as reflected in the Forest Practices Code, which requires recognition and better protection of non-timber values such as biodiversity, wildlife and water quality.

The government's general social and economic objectives for the forest sector are made clear in the goals of the Forest Renewal Program. In relation to the Allowable Annual Cut determinations you must make, I would emphasize the particular importance the government attaches to the continued availability of good forest jobs and to the long-term stability of communities that rely on forests.

Through the Forest Renewal Plan, the government is taking the steps necessary to facilitate the transition to more value-based management in the forest and the forest sector. We feel that adjustment costs should be minimized wherever possible, and to this end, any decreases in allowable cut at this time should be no larger than are necessary to avoid compromising long-run sustainability.

.../2

Province of British Columbia
Minister of Forests
Parliament Buildings
Victoria, British Columbia
V8V 1X4

In addition to the provincial perspective, you should also consider important local social and economic objectives that may be derived from the public input on the Timber Supply Review discussion papers where these are consistent with the government's broader objectives.

Finally, I would note that improving economic conditions may make it possible to harvest timber which has typically not been used in the past. For example, use of wood from commercial thinnings and previously uneconomic areas may assist in maintaining harvests without violating forest practices constraints. I urge you to consider all available vehicles, such as partitioned cuts, which could provide the forest industry with the opportunity and incentive to demonstrate their ability to utilize such timber resources.

Yours truly,

Andrew Petter
Minister

Province of British Columbia
OFFICE OF THE MINISTER

Ministry of Forests

MEMORANDUM

File: 16290-01

February 26, 1996

To: Larry Pedersen
Chief Forester

From: The Honourable Andrew Petter
Minister of Forests

Re: **The Crown's Economic And Social Objectives Regarding Visual Resources**

Further to my letter of July 29, 1994, to your predecessor, wherein I expressed the economic and social objectives of the Crown in accordance with Section 7 of the *Forest Act*, I would like to elaborate upon these objectives as they relate to visual resources.

British Columbia's scenic landscapes are a part of its heritage and a resource base underlying much of its tourism industry. They also provide timber supplies that are of significant economic and social importance to forest industry dependent communities.

Accordingly, one of the Crown's objectives is to ensure an appropriate balance within timber supply areas and tree farm licence areas between protecting visual resources and minimizing the impact of such protection measures on timber supplies.

As you know, I have directed that the policy on management of scenic landscapes should be modified in light of the beneficial effects of the Forest Practices Code. In general, the new policy should ensure that establishment and administration of visual quality objectives is less restrictive on timber harvesting. This change is possible because alternative harvesting approaches as well as overall improvement in forest practices will result in reduced detrimental impacts on visually sensitive areas. Also, I anticipate that the Forest Practices Code will lead to a greater public awareness that forest harvesting is being conducted in a responsible, environmentally sound manner, and therefore to a decreased public reaction to its visible effects on the landscape. In relation to the Allowable Annual Cuts determinations that you make, please consider the effects that the new policy will have in each Timber Supply Area and Tree Farm Licence.

.../2

In keeping with my earlier letter, I would re-emphasize the Crown's objectives to ensure community stability and minimize adjustment costs as the forest sector moves to more value-based management. I believe that the appropriate balance between timber and visual resources will be achieved if decisions are made consistent with the ministry's February 1996 report *The Forest Practices Code: Timber Supply Analysis*.

Finally, in my previous letter I had asked that local economic and social objectives be considered. Please ensure that local views on the balance between timber and visual resources are taken into account within the context of government's broader objectives.

Andrew Petter
Minister of Forests

Invermere Timber Supply Area
Timber Supply Review

Summary of Public Input

BC Ministry of Forests
Invermere Forest District
625 – 4th Street
PO Box 189
Invermere, BC
V0A 1K0

August, 2001

This is a summary of the public input received on the Timber Supply Review in the Invermere Timber Supply Area. This summary does not assess the feasibility or validity of the input or whether it relates to the clearly defined mandate of the chief forester in the allowable annual cut determination.

Invermere Timber Supply Area

Background

As part of the review of timber supply in the Invermere Timber Supply Area (TSA), two opportunities were provided for public input. The first followed release of the Invermere Timber Supply Area *Data Package* and *Information Report* in March 2000. The *Information Report* was a non-technical summary of the draft data and management assumptions that were to be applied in reviewing the timber supply for the Invermere TSA. A 30-day review period, ending April 28, 2000, was provided for the public to comment on these documents.

On October 5, 2000, the British Columbia Forest Service released the *2000 Invermere Timber Supply Area Analysis Report* and *Public Discussion Paper*. The public was encouraged to review and comment on the accuracy of the information in these documents and to provide additional information during the 60-day review period that ended December 8, 2000.

This report summarizes the input received during both public review periods. This information was provided to the chief forester for his consideration when he reviewed the allowable annual cut (AAC) for the Invermere TSA. The first section of this summary outlines the public review process implemented by the Forest Service, and describes the types of public input received. The second section summarizes the public input in sufficient detail to indicate the range of input received. The original submissions (with personal identifiers removed in accordance with the *Freedom of Information and Protection of Privacy Act*) can be reviewed at the Invermere Forest District office.

Public Review Process and Response

Invermere District staff actively solicited public input on the Timber Supply Review in the Invermere TSA through the following actions:

- direct mail-out of about 36 copies of the *Information Report*, *Data Package*, *Analysis Report* and *Public Discussion Paper* to local governments and MLAs, First Nations, licensees, forest workers, environmental groups, ranchers, consultants and interested individuals in the Invermere TSA or adjacent timber supply areas.
- the *Data Package* and the *Invermere Timber Supply Area Analysis Report* were available at the district office.
- a meeting regarding the *Data Package* and the *Analysis Report* was held with representatives from the East Kootenay Environmental Society (six attendees).
- the Timber Supply Review documents were discussed with the local MLA.
- copies of the documents were provided to the local media.
- newspaper advertisements were placed, advising of the availability of the documents for review by the public.
- telephone contact was made with various individuals and organizations, providing further information if needed and encouraging them to provide input.

The Invermere Forest District also received four written submissions on the *Data Package* and two submissions on the *Analysis Report* (see Appendix 1).

Public Input

In this section, public input on the information presented in the Timber Supply Review documents for the Invermere TSA is summarized under the following headings:

- Data Package (and Information Report)
- Timber Supply Area Analysis Report (and Public Discussion Paper)
- Other comments

Data Package

Inoperable Areas

Two forest industry submissions comment on the definition of inoperable sites. Slocan Forest Products (SFP) says steep slopes below the operability line should not be excluded from harvesting if site conditions permit harvesting and successful reforestation. The company says they know of areas that have been logged yet would be excluded based on the *Data Package* definitions.

Crestbrook Forest Industries (CFI) provides details about the five per cent of their harvesting since 1987 that has occurred in stands that are being excluded from the harvesting land base on the basis of operability. These sites should be included, says the company, particularly lodgepole pine stands with a site index of <13 metres at 50 years of age.

Problem Forest Types

Three submissions comment on problem forest types that are excluded from the timber harvesting land base (THLB). SFP says the netdown should be reconsidered as recent practice in lodgepole pine stands has been to utilize down to a top diameter of less than four inches. SFP says the pressure on small log stands will likely increase due to the existence of a small log manufacturing facility and technology improvements. The company says this provides an opportunity to increase the THLB.

CFI requests further information on how these types were defined and recommends a review of site index cut-offs for problem forest types 2 and 3. The East Kootenay Environmental Society (EKES) expresses concern that problem forest types are insufficiently accounted for. The society says industry has often chosen to avoid harvesting these types and this must be accounted for as a land base netdown.

Roads, Trails and Landings

EKES says the estimates of land base netdowns required to account for roads, trails and landings (RTLs) are based on the Forest Practices Code, but that rights-of-way in many places are greater due to terrain or Workers Compensation Board requirements. The society says the 7.5 per cent and 8.1 per cent figures for existing and future RTLs should be increased to better reflect reality.

Both SFP and CFI express disagreement with the use of a 20-metre road width for existing mapped roads, saying that is the right-of-way width and only on steep slopes will that width be fully used. The companies say the area removed from productivity is substantially less, since in most cases trees will grow on the toe of the fill and crown closure will overlap the road. CFI notes that an adjoining TSA used a width of 15.9 metres for secondary roads and 8.5 metres for logging roads. SFP says the reduction should only include the area from the top of the cut to the toe of the fill, about a 10- to 15-metre width.

CFI and SFP question the use of a 4.5 per cent area deduction to account for existing skid trails. SFP says based on their experience, 2.5 per cent is more appropriate. SFP also says the average landing size used (.25

ha) is too high, noting a Forest Practices Code audit that indicates the average to be about .2 ha. The company notes the current practice is to build fewer and, in some cases, no landings.

With regard to future RTLs, both companies question the 0.6 per cent reduction for roads, and say the 4.5 per cent reduction for skid trails is excessive due to rehabilitation requirements and the three per cent reduction for landings should be reduced to at least 2.3 per cent.

Existing Forest Inventory

EKES questions whether an inventory audit has been done and how it is reflected in the timber supply analysis.

Expected Rate of Growth

Two submissions note that the analysis ignores the effects of climatic warming and its impacts on tree growth. EKES says the presence of drier subzones in this TSA means the effects will likely be significant and this should be reflected in a sensitivity analysis.

Two forest industry submissions say genetically improved stock should not be excluded from the base case as it is increasingly available, the legal requirement to use it is in place, and both companies have planted genetically improved spruce.

CFI and SFP maintain that the operational adjustment factor (OAF) used for seed-tree analysis units is excessive, and is applied too broadly to reflect current or past harvesting practice. The two companies also request further information on the determination of the OAF used to account for losses from Armillaria root disease.

Minimum Harvestable Age

CFI raises several questions regarding the minimum harvestable ages used in various analysis units. The company particularly questions the age used in the partial cut units, saying a lower minimum harvestable age would facilitate earlier entry and better support the goal of increasing forage production.

Not Satisfactorily Restocked Areas

CFI recommends that the 930 hectares of backlog NSR should be returned to the productive land base after 40 years. The company says these areas will likely reforest to coniferous species over time.

Silvicultural Systems

Two forest industry submissions question the percentages used in the *Data Package* for various harvesting methods. SFP says from 1996-1998 they harvested about 15 per cent of their area with cable systems and the rest was ground harvested. CFI says their data indicates 18 per cent for cable and 1.6 per cent for helicopter harvesting.

Utilization Standards

EKES says that the forest industry has accepted and begun to move forward on implementation of reduced utilization standards as a result of the Forest Action Plan, and these should be reflected as a timber supply netdown.

SFP says a 20-cm stump height would be closer to current practice than the 30-cm height used in the *Data Package*.

Landscape Level Biodiversity

EKES says that Biodiversity Emphasis Options (BEOs) now being used in the TSA should be reflected in the base case as current practice. The society says, based on the Kootenay-Boundary Higher Level Plan objectives, the analysis must allow for an operable land base netdown for connectivity and grizzly habitat to

reflect implementation of the mature components of the BEOs. As well, EKES says the need to recruit mature and old stands must be reflected in the base case. CFI says the base case should use the 10-45-45 BEO formula, assuming BEOs have not been formally established in the TSA.

Two forest industry submissions question why Kootenay National Park is not considered to contribute to biodiversity and seral stage targets when five provincial parks do contribute. The Sheep Creek Community is of the opinion that the land base that supplies timber should also meet the requirements for other values. They maintain that since parks do not contribute timber, they should not be considered to provide biodiversity values, wildlife habitat, etc.

Stand Level Biodiversity

The Sheep Creek Community says wildlife tree patches (WTPs) need greater recognition because of their importance, and this should be mirrored in a lower harvest level. EKES notes that residual volume in cutblocks should be appropriately netted down.

SFP says they cannot comment on this factor since no data was provided. The company says all previous exclusions and Crown forest outside the harvesting land base must be used whenever possible to meet stand level biodiversity objectives. CFI says they await the outcome of the wildlife tree mapping project and request a summary of its findings.

Forest Ecosystem Networks

Two forest industry submissions question the Forest Ecosystem Networks (FENs) used in the *Data Package*. SFP says FEN areas were never intended for preservation but were to employ special management considerations, such as variable retention harvesting, and to include riparian and other features already netted out of the harvesting land base.

SFP and CFI note that licensees did not agree with the FENs developed outside of the Total Resource Plan process because they didn't adequately use the non-contributing land base. CFI says the utility of any mapping of FENs is questionable as any networks are to be achieved through deployment of mature and old seral targets, not through pre-emptive mapping.

Forest Cover Requirements

SFP and CFI raise various questions about adjacency requirements, including the use of the top 100 trees to determine the green-up measurement, using free-to-grow survey data to determine green-up, and the green-up height requirement for large patch pine based on the Kootenay-Boundary Land Use Plan (KBLUP).

Environmentally Sensitive Areas

SFP and CFI request further information on the reductions for areas with environmental sensitivity due to plantation problems, domestic water intakes, recreation values and wildlife.

Riparian Habitat

EKES says riparian management zones are necessarily wider than Forest Practices Code requirements in many areas and this should be more appropriately modeled. The Sheep Creek Community says riparian zones are not adequately considered in the analysis and must be widened.

SFP and CFI request further detail on the netdowns and forest cover requirements in riparian management zones.

Domestic and Community Watersheds

EKES says the analysis model does not address public concerns in watersheds such as the Lussier where Equivalent Clearcut Area (ECA) restrictions will prevent further harvesting for some time. EKES says netdowns should be included for the Lussier and extrapolated to all drainages with similar hydrological considerations.

SFP says community watersheds should not be subjected to forest cover constraints as they are already subject to an ECA analysis. The company also says 26 years to achieve a six-metre green-up height in areas where they are strongly motivated to perform aggressive silviculture programs seems very conservative. CFI says ECA calculations are based on the Crown forest land base and the application of forest cover requirements to only the net harvesting land base for community watersheds is not appropriate.

Fire Maintained Ecosystem Restoration

EKES expresses concern that restoration management will not be appropriately modeled and says that restoration requires partitioning of additional harvest into overstocked areas in the Trench. SFP says the maximum 35 per cent of the area below green-up height is inconsistent with the goal of promoting open forest conditions. CFI makes the assumption that that cover constraint does not apply to the partial harvest analysis units, and suggests constraints on lodgepole pine- and larch-leading open forest and open range types should be removed, in order to promote early harvesting and forage production.

Wildlife

The Sheep Creek Community says the number of endangered, threatened and vulnerable species is increasing in the TSA and the Ministry of Environment has been pushing for more habitat, more road closures, and reduced harvesting to mitigate the stresses on wildlife. EKES says the one per cent impact of wildlife habitat areas should be accounted for, either through a land base netdown or a base case timber supply netdown.

EKES says the parkland definition needs to be expanded to all areas that include whitebark pine in all Caribou Management Zones. The society also says caribou management guidelines should be appropriately modelled to reflect impacts spatially as is occurring in Buhl Creek.

Two forest industry submissions question why ungulate winter range cover constraints are applied over just the THLB rather the entire Crown forest. Areas outside the harvesting land base provide some of the best forage and cover opportunities, according to the companies. In addition, the companies disagree with the cover requirement of 40 per cent mature as this guarantees cover but does nothing to guarantee food supply throughout a rotation.

Non-Recoverable Losses

Four submissions comment on how timber volume losses due to Armillaria root disease are accounted for. Two forest industry submissions believe the loss estimates are too high and that root disease losses are accounted for in other deductions or calculations. The Sheep Creek Community believes root disease must be considered as an unsalvaged loss, and also says that the effect of climate warming on unsalvaged losses must be addressed. EKES expresses concern that root disease losses be realistically accounted for.

Recreation Areas

Two industry submissions question why UREP areas (areas set aside for the Use, Recreation and Enjoyment of the Public) smaller than 100 hectares are reserved from harvesting. The companies say the intent was not to create small provincial parks and that recreational values can be protected through forest cover constraints similar to other TSAs.

Invermere Timber Supply Area

Socio-Economic Factors

The submission from the Sheep Creek Community says the "working forest" is no longer the sole domain of the forest sector, pointing to a sudden and dramatic shift in the economy, with a move from timber to tourism and recreation. The community suggests that objectives, targets and goals be developed in the TSA that expand the reality of the working forest.

Timber Supply Area Analysis Report

Land Base Factors

Tembec (formerly CFI) says the base case should have included lodgepole pine- and spruce-leading stands with lower site indexes, since five per cent of their harvesting since 1987 has occurred in these stands. The company also questions the logic behind the criteria that define problem forest types 2 and 3.

From 1996 to 1998, 18 per cent of Tembec's harvested volume was cable harvested and 1.6 per cent was heli-logged. The company says this indicates a trend towards increased steep slope harvesting and supports the inclusion of steep side slopes that are excluded as inoperable in the analysis.

Tembec says the 100 per cent exclusion of sites with severe plantation problems is excessive, as many of these sites could be reforested with the variety of stock types available and the proven success of duff planting.

With regard to land base deductions for roads, trails and landings, Tembec says using a 20-metre road width is excessive, noting that an adjacent TSA used 15.9 metres for secondary roads and 8.5 metres for logging roads. The company says the 4.5 per cent reduction for skid trails is inappropriate given Code requirements for full rehabilitation.

Forest Inventory Factors

Tembec notes that a sensitivity analysis indicates short-term timber supply is extremely sensitive to the estimates of volume in existing stands. The company says previous discussions with district staff indicated the potential for an increase in volume estimates, based on a cruise/inventory comparison.

EKES says Figure 17 supports their position that the existing inventory of mature stands must be reserved from harvesting now, in case inventories are less than estimated in the analysis. The society says this volume will be needed in 50 years to prevent a trough in timber supply.

Expected Rate of Growth

EKES expresses concern about reliance on managed stands to support an artificially high allowable annual cut (AAC) The society offers the following reasons:

- no reliable, long-term data exists that supports the growth-and-yield analysis for partial cutting or for mixed species stands.
- volume loss to Armillaria root disease is still under study and may well be underestimated.
- in areas where lodgepole pine and Douglas-fir naturally regenerate, genetically improved stock may not be identified and managed for.
- genetic improvement does not guarantee the stock will withstand events such as windthrow, fire, drought, etc. Breeding for one attribute may produce other attributes less favourable for survival and growth.
- the recent Tembec forest health study showed total pests affecting all conifers ranged from 0 to 39 per cent. The most obvious trend was the moderate to high infestation levels in virtually all lodgepole pine-leading stands at lower elevations.

EKES says the base case shows an average volume of 178 cubic metres per hectare, a seven per cent increase over the 1995 base case. The society asks where the long-term data is to support the assumption that such growth rates are actually possible.

Tembec questions the validity of how OAFs are applied to account for seed tree silvicultural systems and losses to Armillaria root disease. The company also says the use of genetically improved seedlings should have been included in the base case, as it is current practice. Tembec says the estimate of a 1.3 per cent gain in long-term yield is pessimistic as the current gain is 11.2 per cent and expected to increase to 20 per cent for spruce.

Tembec notes that timber supply is very sensitive to site index and says the chief forester should consider the results of Old Growth Site Index studies as an upward pressure. EKES urges the chief forester not to rely on adjusted site indices for the following reasons:

- doing so relies on second-growth stock to meet the long-term harvest level.
- because of stated biases and cautions in studies; quotes are provided from Nussbaum and Nigh.
- because 45 per cent of the stands in the THLB are above the minimum harvestable age.

Tembec raises a number of particular questions with regard to minimum harvestable ages (MHA), while EKES notes that in partial cuttings and commercial low thinnings, harvest entries are made prior to the MHA being reached.

Not Satisfactorily Restocked Areas

EKES notes a discrepancy in the area of NSR between the *Information Report* and the *Analysis Report*.

Forest Cover and Green-Up Requirements

Tembec questions if cover requirements for visual quality zones, community watersheds and the Trench are based on the total Crown forest area. The company says this is the correct approach, as used in adjoining TSAs. Tembec questions the three-metre green-up height for high elevation pine units, saying the KBLUP uses 2.5 metres. The company also maintains the forest cover requirements in the Trench may restrict the ability to harvest stands and create grasslands.

EKES questions whether the model captures harvesting adjacent to partial cut areas that meet green-up requirements. The society says it appears the model could use partial cutting, and harvest and road an entire landscape unit. EKES also refers to the 1996 Rationale Statement in which the chief forester noted the need for a study of the number of harvesting passes that would most accurately represent cutblock adjacency constraints in this TSA. EKES says this study, although not mentioned in the *Analysis Report*, is critical.

Recreation Areas

Tembec notes the analysis did not include UREPs smaller than 100 hectares. The company says the intent was not to create small parks but to recognize recreational values, which could be accomplished with forest cover constraints.

Watersheds and Riparian Areas

EKES says that projected population growth in the TSA means greater demand on forest resources, especially drinking water. While the Forest Practices Code applies to harvesting in tributaries that are critical fish habitat or community watersheds, the long-term implications of harvesting in watersheds is not considered in the analysis.

EKES also notes new management direction implied in letters from the Department of Fisheries and Oceans and the Ministry of Forests (July 5 and July 18, 2000, respectively) regarding harvesting practices adjacent to small streams. The society says this should result in increased reserves and higher retention along these streams, resulting in further reductions to the THLB.

Wildlife

Tembec notes that short-term timber supply is highly sensitive to ungulate winter range guidelines. The company says the guidelines as written could result in sufficient cover but insufficient forage, and suggest that a less restrictive guideline aimed at producing forage would create upward pressure on short-term timber supply.

EKES states its objection to the presentation of Figures 19 to 21, saying these graphs only show timber values without reference to ungulate population decreases linked to loss of forest habitat. The society says the graphs imply trade-offs between timber and wildlife could satisfactorily be made, but this isn't the case in much of the TSA as ungulate winter range provides more than wildlife values (water quality, riparian, visuals and recreation).

EKES also expresses the opinion that partial cutting does not necessarily meet ungulate winter range cover requirements as it is often based on volume retention not crown closure. Examples are provided in this submission.

Biodiversity

Tembec questions why only provincial parks contribute to meeting biodiversity objectives, and not Kootenay National Park. Including it would have contributed to meeting old and mature seral stage targets, creating upward pressure on the timber supply forecast.

EKES raises a number of concerns about biodiversity management, including:

- areas identified as Forest Ecosystem Networks or Old Growth Management Areas should either be excluded from the THLB or modelled with extended rotations.
- the graph of current age class distributions (Figure 6) does little to illustrate the actual biodiversity situation in the TSA. A more thorough analysis would no doubt show deficits in low- to mid-elevation ecosystems.
- Invermere district's approach for managing for biodiversity is contrary to the KBLUP Implementation Strategy.
- old seral requirements were intended to be met across the landscape proportionally.
- the graphs in Figure 15 illustrate that areas designated for old growth and old growth recruitment are primarily outside the THLB. In the long term, it is reasonable to expect that these areas will need to be recruited from within the THLB, creating pressure for an AAC reduction.
- the base case assumes that forests in parks and the inoperable will all grow to 250 years. This is unproven and highly unlikely.

Harvest Flow

Tembec says the chief forester should consider not following a pine priority for harvesting, noting the positive short-term effects on timber supply that could result. The company says all major drainages are roaded and this improved access reduces the chance of a major pine beetle epidemic. According to Tembec, public opinion will likely work against a pine priority if there is no beetle outbreak.

EKES says the model of harvesting oldest stands first does not reflect current practice, which is more random. The society makes the following points:

- pine priority is giving ways to stands susceptible to Douglas-fir bark beetle, which are not necessarily the oldest.
- partial cutting removes the smaller stems and often the younger and more shade tolerant trees.
- large salvage operations for bark beetle may remove some older stands, but harvesting is not known to be that specific.
- the requirements to reserve older stands will prevent the removal of oldest first over the entire TSA.

Socio-Economic Impacts

EKES says that tourism is now the largest employment sector and maintaining the current AAC compromises this sector's ability to operate and its future options. The society says the government's encouragement of economic diversity (both front- and back-country tourism) will likely have significant negative effects on wildlife populations. This is not acknowledged in the analysis, the society says, but will likely lead to an increased need for harvest constraints to accommodate other uses.

Other Comments

Many submissions commented on factors or issues other than those specifically covered by Timber Supply Review documents. These comments are summarized in this section.

Timber Supply Review Process

EKES is of the opinion that the TSR process does not adequately address impacts on biodiversity and other non-timber values across the landscape, but is biased toward maintaining harvest levels. The society says until the TSR becomes spatial and better reflects management for all values, timber supply will be inflated well beyond a sustainable level. EKES says the base case should reflect mandated management, including the KBLUP Implementation Strategy, Higher Level Plan objectives and implementation of landscape unit planning with appropriate netdowns.

EKES is also concerned that the analysis does not consider the likely impacts of climate change and provides information on anticipated impacts on BC forests. The society also urges consideration of three principles from the Forest Stewardship Council.

Tembec (CFI) expresses concern that the timber supply analysis was occurring at the same time that public input was being gathered on the *Data Package*.

Management

EKES says the Invermere Forest District is managing to the lowest levels under the Forest Practices Code and is implementing provincial direction intended for situations of critical timber shortage. The society says the floor for biodiversity management has become the ceiling.

The Sheep Creek Community advocates meaningful inclusion of the public in decision-making and more decision-making at the community level. The community also says it would be good management to substantially increase the Forest Service reserve in light of the immense changes occurring in the TSA.

Harvest Levels

Tembec expresses the opinion that there is ample evidence to set an AAC of 581,570 cubic metres for the Tembec Supply Area.

The Sheep Creek Community says that attempting to maintain or increase the AAC is a travesty. They say it should be reduced to account for global warming, First Nations land claims, wildlife habitat, Special Management Zones, increased riparian protection, root rot losses and socio-economic changes.

EKES urges the chief forester to set an AAC indicative of a long-term harvest level on a harvesting land base that provides for all life,

not just the forest sector. The society makes the following points:

- maintaining the current harvesting levels for as long as possible will reduce options for future generations (such as having large areas of intact ecosystems).
- relying on old-growth recruitment areas to shore up the AAC and maintain an unrealistic long-term harvest level is irresponsible.
- First Nations concerns must be reflected as a possible reduction to the overall AAC to reflect removals form the THLB.
- the AAC should reflect society's view as a whole rather than timber revenue targets.
- an environmental impact analysis and habitat supply analysis were not carried out in addition to the timber supply analysis.

Submissions received by the Invermere Forest District

Submissions received on the Data Package

Forest industry

Slocan Forest Products, Radium Division

Crestbrook Forest Industries Ltd. (known as Tembec Industries Inc., effective October 1, 2000)

Interest groups

East Kootenay Environmental Society

Concerned Residents of the Sheep Creek Community

Submissions received on the Timber Supply Analysis Report

Forest industry

Tembec Industries Inc., BC Division

Interest groups

East Kootenay Environmental Society